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Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY, LUDLOW GRISCOM, STUART KIMBALL HARRIS — Associate Editors

VOLUME 44

1942

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

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Vol. 44. January, 1942. No. 517.

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A NEW SPECIES AND A NEW VARIETY OF SOLIDAGO FROM KENTUCKY

E. Lucy Braun

In the spring of 1940, in one of the many sandstone "rock-houses" of the Red River country of Menifee County, Kentucky, in the Cumberland National Forest, the writer found plants of what appeared to be an undescribed species of goldenrod. Even at this season (early May) when the vegetative stems were about 6–10 inches tall, the distinctness of the species was evident. Dry stems of the previous autumn still retained their shriveled leaves, which when moistened could be pressed into shape, and ripe fruits still stood loosely in the dry involucres, for in the protection of a rockhouse no storms could reach the plants to batter down the delicate stems.

A revisit to the area in September was planned, but other things prevented. Then, on September 16, 1941, sixteen months after the first collection, we again ascended the "hollow," steep and rocky toward the upper end where footing was in places precarious and hand-holds lacking or uncomfortable because of the plentiful Hercules' Club (*Aralia spinosa*). In the dry sand under the sheltering roof of the rockhouse, a mass of Solidago in full bloom rewarded our efforts. The next day, more plants were found on the other side of the Red River, in Powell County.

The plant evidently belongs to the *Flexicaules* group of *Solidago*. Its decumbent habit, white-pilose stems and lower leaf surfaces, very delicate leaf-texture (leaves so thin that coarse print is readable through the leaves) and exceedingly soft feel

are features which at once are apparent. Comparison with other species of the group emphasizes the specific distinctness of the plant of this unusual habitat.

SOLIDAGO **albopilosa,** sp. nov., caulibus gracilibus, debilibus 2–5.5 dm. altis striatis dense albopilosis; foliis caulinis inferioribus medianisque late ovatis vel late ovalibus 3–6 cm. longis 3–5 cm. latis, acutis, in basem truncatum abrupte contractis, serratis tenuissimis, supra pubescentibus infra pilosis, pilis albis ad venas principales 2 mm. longis; inflorescentiae foliis similibus minoribus serratis; petiolis laminae longitudinis secundam vel tertiam partem aequantibus; involucris 4 mm. altis; bracteis obtusis, 1–3-costatis; radiis 4 vel 5; achaeniis pubescentibus.

Plants stoloniferous, without basal rosettes; short vegetative stems, however, are numerous. Stems slender, weak, often decumbent and sprawling, or even pendent, 2 to 5½ dm. long, slightly zigzag, striate, densely white-pilose. Lower and median stem-leaves broadly ovate or broadly oval, blades 3–6 (–7) cm. long, 3–5 (–6) cm. wide, acute at apex, abruptly contracted at base, base varying from slightly cordate to truncate with scarcely winged petiole to rounded with a narrow cuneate extension along petiole, serrate; leaves of the inflorescence similar but smaller, and narrower, serrate. Petioles of the cordate and truncate leaves ½ to ⅓ the length of blades, those of the oval leaves generally shorter. Leaves very thin and delicate, and exceedingly soft, pubescent above, pilose beneath with white hairs, those on the principal veins 2 mm. long. Inflorescence axillary and terminal, but thyrse, if present, very poorly developed, clusters few-flowered, the lowest occasionally 2–3 cm. long, racemosely branched and leafy-bracted; axis of inflorescence and pedicels densely white pilose. Flowers fragrant. Involucre 4 mm. high, bracts obtuse, pubescent toward tip, 1- to 3- (or occasionally 5-) ribbed, only the central rib distinct. Rays 4 or 5, rarely 3. Achenes 1.8–2.2 mm. long, pubescent, pappus capillary, 3 mm. long.—KENTUCKY: in dry or moist sandstone rockhouses of the basal Pottsville formation, head of ravine tributary to Red River between Glady Creek and Wolfpen Creek, Menifee County, May 4, 1940, *Braun*, Ky. no. 2915; same locality, Sept. 16, 1941, *Braun*, Ky. no. 4278 (TYPE in Gray Herbarium and isotypes deposited in a number of herbaria); rockhouses on Gray's Branch (also tributary to Red River), Powell County, Sept. 17, 1941, *Braun*, Ky. no. 4295; same locality, Oct. 12, 1941, *Braun*, Ky. no. 4333.

Solidago albopilosa was found growing in company with *Heuchera parviflora* var. *Rugelii* and *Silene rotundifolia.* Vegetative stems of the Solidago resemble the Silene. The goldenrod is

strictly limited to sites beneath projecting cliffs and the roofs of the rockhouses. Even though so abundant that it carpets the ground in the rockhouses, it stops abruptly at a line coinciding with the cliff margin far above. In one rockhouse on Gray's Branch, it extends under the overhanging cliff into almost dark crevices, there growing with filmy fern, *Trichomanes Boschianum.* The habitat is similar to, but drier than that in which *Eupatorium deltoides** was found. As yet the two species have not been found in the same rockhouse. The nearest station for the Eupatorium is about 5 miles from those of the Solidago.

Just beyond the outer line of growth, in both stations, one plant was found which had taller, less weak although slender stems, larger and proportionately narrower leaves less abruptly contracted at the base, less pilose stems and leaves, and 3 to 4-rayed heads. One (no. 4279, Menifee Co.) has a fairly well developed terminal thyrse as well as axillary clusters, suggesting the inflorescence of *S. latifolia;* in the other, the inflorescence is almost entirely of axillary clusters. In leaf-shape, but not in stature, in pubescence nor inflorescence, these plants of marginal situation slightly resemble the form of *S. latifolia* which is common in mesophytic woods of the Red River. (*Solidago latifolia* in this area has the leaves broadest near the middle, and tapering gradually, not abruptly, to a very short petiole.) The strongest resemblance is, however, with *Solidago albopilosa.* The fragrance of the flowers of *S. albopilosa* attracts many bumble bees. As Solidago is insect-pollinated occasional transfer of pollen from one to another species in this closely related series might result in hybridization. The two intermediate plants may be hybrids.

Solidago rigida L., var. **glabrata,** var. nov., a forma typica differt caulibus foliisque glabris.

Differs from the typical form of the species in its glabrous stem and leaves.—Kentucky: in dry soil with prairie plants, near Cave City, Barren County, Sept. 11, 1940, *Braun,* Ky. no. 3629. Type in Gray Herbarium, isotype in writer's herbarium.

In appearance and stature this plant is like typical *S. rigida.* Its glabrous stems, and smooth, glabrous, almost shiny leaves will readily distinguish it from the species. Occasional scattered hairs on some of the leaves are longer, more slender and less stiff than those of the typical form, and without the coarse

* Rhodora **42**: 50–51. 1940.

elevated base. The leaf-margin is hispid-ciliate, although less prominently so than in the species. Short hispid hairs, widely spaced, are arranged in lines along the branches of the inflorescence; pedicels pubescent.

The University of Cincinnati,
Cincinnati, Ohio.

GREAT BASIN PLANTS V.—AQUATICS

Bassett Maguire and G. Hortin Jensen

The following records are presented in continuation of discussion of rare or interesting plants of the Great Basin. Grateful acknowledgment is made to the Utah Wildlife Research Unit of the Federal Fish and Wildlife Service for certain specimens made available to this paper.

Potamogeton americanus C. & S., in 12 in. of water, Stewart Lake, Uinta Co., Utah, July 10, 1938, *G. H. Jensen & L. Dargan*, no. 153.

Until this present collection came to light, no Utah material had been seen by the writers, although the species had been included by Tidestrom in the Flora of Utah & Nevada. Failure to find this plant after a number of years search had almost convinced us that it was not likely to have been found in the state, and that its inclusion in the Utah range might have been due to misinterpretation of the amphibious form of *P. gramineus* L. This latter species abounds in the state, and, in the absence of well-formed submerged leaves, strongly simulates *P. americanus*.

*Potamogeton crispus L., Ogden Bay Refuge, Weber Co., Utah, Aug. 2, 1937, *C. S. Williams*, no. 1241.

This introduced European species, known commonly from Minnesota eastward and sparingly from the Pacific Coast region, is now apparently collected only from the above station in the entire Rocky Mountain and Great Basin areas.

*Potamogeton filiformis Pers. (*P. interior* Rydb.), along dike, East Lake, Locomotive Springs, Box Elder Co., Utah, Sept. 15, 1936, *D. Hobson & Geo. Piranian*, no. 14850; Lyman Lake, Black's Fork River, Wasatch National Forest, Summit Co., Utah, July 27, 1939, *D. Hobson*, no. 51.

* The asterisk designates plants which are thought previously to have been unreported from our region.

The typical form seems to be considerably less common in Utah than the var. *borealis* (Raf.) St. John, and less frequent than the following.

POTAMOGETON FILIFORMIS Pers. var. *MACOUNII Morong, shallow water, Unit 2, Bear River Refuge, Box Elder Co., Utah, Sept. 12, 1932, *Maguire*, no. 3183; eddies of Salmon River, 10 mi. N. Challis, Custer Co., Idaho, July 15, 1934, *Maguire & Maguire*, no. 5434; Strawberry River, Wasatch National Forest, Wasatch Co., Utah, Sept. 8, 1939, *D. Hobson*, no. 39; side stream, West Fork, Smith's Fork, vic. Hewinta, Wasatch National Forest, Summit Co., Utah, July 10, 1939, *D. Hobson*, no. 31: abundant, shallow stream, 1 mi. W. Moroni, Sanpete Co., Utah, June 13, 1940, *Maguire*, no. 18651; frequent, shallow, rapidly flowing water, Fremont River, 1 mi. E. Fruita, Wayne Co., Utah, July 1, 1940, *Maguire*, no. 19273. All of the above collections seem to come well within the var. *Macounii* as delimited by St. John (1916), except *Maguire*, no. 18651 from Sanpete Co., Utah. The specimens of this collection strongly suggest a condition intermediate to *P. vaginatus* in the development of excessively large primary leaf sheaths.

The following three collections are intermediate between typical *P. filiformis* and the var. *Macounii:* warm springs along San Carlos River, San Carlos Indian Reservation, Gila Co., Ariz., March 30, 1935, *Maguire*, no. 10335; Posey Lake, Garfield Co., Utah, Sept. 3, 1936, *Geo. Piranian;* in 5 ft. of water, Tony Grove Lake, 8000 ft., Bear River Range, Cache Co., Utah, Aug. 5, 1938, *Maguire*, no. 16085.

POTAMOGETON FOLIOSUS Raf., var. *GENUINUS Fern., beaver pond, 1 mi. N. Warner Ranger Station, 9000 ft., La Sal Mts., Grand Co., Utah, Aug. 3, 1933, *Maguire et al*, no. 4368; common, Posey Lake, 9500 ft., Aquarius Plateau, Powell National Forest, June 27, 1940, *Maguire*, no. 19161; Strawberry River, Wasatch Co., Utah, Sept. 10, 1939, *D. Hobson*, no. 33; slow stream in meadow, 3 mi. n. e. Logan, Cache Co., Utah, May 21, 1939, *Maguire*, no. 16685.

Apparently only the var. *macellus* (Fernald, 1932) has previously been known in Utah.

*POTAMOGETON FRIESII Rupr., Bear Lake, W. Fk., Bear River, Summit Co., Utah, Sept. 4, 1939, *Dean Hobson*, no. 37; Lyman Lake, Black's Fk. Creek, Summit Co., Utah, July 27, 1939, *Dean Hobson*, no. 52.

Collections made in Glacier National Park, Montana (Maguire, 1934) revealed the presence of this species in the western states, extending the then known range south and westward from

British Columbia, Alberta, and North and South Dakota (Fernald, 1932). The above collections further extend the range by more than 700 miles.

*POTAMOGETON GRAMINEUS L. var. GRAMINIFOLIUS Fries, common on mud and in pools in marsh which had been covered with water during spring and early summer, south end Fish Lake, Aug. 24, 1938, Sevier Co., Utah, *Maguire*, no. 16202.

In addition to this cited number many collections have been made within the state, showing it to be common and generally distributed. This species, the *P. heterophyllus* of Am. authors, is recorded by this latter name by Tidestrom (1925) from Ruby Lake, Nevada. It is possible that much of material of Utah passing as *P. americanus* is *P. gramineus*, since the amphibious form of this species, becoming very coarse, considerably resembles the former.

POTAMOGETON PRAELONGUS Wulfen, common in water 6–15 ft. deep, vic. Twin Creeks, Fish Lake, Sevier Co., Utah, 8900 ft., Aug. 25, 1938, *Maguire*, no. 16219; Posey Lake, Garfield Co., Utah, Sept. 3, 1936, *Geo. Piranian*, no. 556; abundant, Posey Lake, Aquarius Plateau, Powell National Forest, Garfield Co., Utah, June 27, 1940, *Maguire*, no. 19162; Stanley Lake, Challis National Forest, Custer Co., Idaho, *A. S. Hazzard.*

Recorded by Tidestrom (1925) from Fish Lake, Utah, this species proved to be quite frequent, in water from 6–18 ft. deep of this lake. It is abundant in Posey Lake, the above record adding the second known station within the state. The Idaho collection of Dr. Hazzard offers a new record for the little known distribution of the species in this state.

*POTAMOGETON BERCHTOLDI Fieb., *P. pusillus* L. var. *mucronatus* (Fieber) Graebn., spring 1 mi. west of Logan, Cache Co., Utah, 4500 ft., *Maguire*, no. 13883; Fish Lake, Sevier Co., Utah, 8900 ft., *Maguire*, nos. 16200, 16203, 16174, and 16222; Bear River Refuge, Box Elder Co., 7200 ft., *Maguire*, no. 3182; all of these collections from Utah.

POTAMOGETON BERCHTOLDI Fieb. var. *TENUISSIMUS (Mert. & Koch) Fernald, *P. pusillus* L. var. *tenuissimus* Mert. & Koch. Bear River Refuge, June 18, 1936, *Maguire et al*, no. 14003; and two collections, *Piranian & Hobson*, nos. 13990, June 24, 1936, and 15997, June 23, 1936, all from the Bear River Refuge, Box Elder Co., Utah.

The excellent distribution maps of Fernald reveal no localities for the cosmopolitan *P. Berchtoldi* (*P. pusillus*) in Utah or in any

of the contiguous states. Rydberg, (1906) cites three localities from Colorado. The typical form as indicated by the above collections is obviously not uncommon in the state. The var. *tenuissimus* is known thus far only from the brackish waters of the Bear River Refuge.

*POTAMOGETON ROBBINSII Oakes, Stanley Lake, Challis National Forest, Custer Co., Idaho, July 30, 1934, *A. S. Hazzard.*

The above collection apparently extends considerably southward the known range of the species, rare in the Intermountain Region, and previously unknown from the Great Basin.

*POTAMOGETON TENUIFOLIUS Raf., abundant, in water 3–12 ft. deep, narrows near north end of Fish Lake, *Maguire,* no. 16208; common in water 6–12 ft. deep, vic. outlet Twin Creeks, Fish Lake, 8900 ft., Sevier Co., Utah, *Maguire,* no. 16220; Silver Lake, Brighton, Big Cottonwood Canyon, Salt Lake Co., Utah, *Maguire,* no. 13156.

This species is possibly the *P. alpinus* or *P. lucens* of the Tidestrom (1925) flora.

*POTAMOGETON ZOSTERIFORMIS Fernald, gravelly bottom, shallow water, east side of North Bay, *Maguire,* no. 16207; soft muck bottom, North Bay, *Maguire,* no. 16226; both collections from Fish Lake, Sevier Co., Utah, altitude 8600 ft.

The distribution records and map of this species, given in much detail in the recent monograph of Fernald (1932), show this locality to occur in the center of a vast area in which the plant has hitherto been unknown. The nearest station in any direction from this newly discovered one is over 500 miles distant.

*NAJAS FLEXILIS (Willd.) Rostk. & Schmidt, subsp. **caespitosa** Maguire, subsp. nov. Plantae dense caespitosae, 2–4 (5) cm. altae; foliis integris; testis cum (40) 50–70 seriebus longitudinalibus areolarum circum semen.

Plant densely fastigiately cespitose, 2–4 (5) cm. high; leaf margins essentially entire, rarely provided with a few fine spines; seed coat finely reticulate with (40) 50–70 longitudinal rows of areolae; in other critical characters similar to typical *Najas flexilis.*—TYPE. Common, sand-gravel bottom, shallow water to 12 in., Pelican Point, Fish Lake, 8600 ft., Fish Lake National Forest, Sevier Co., Utah, Aug. 3, 1940, *Bassett Maguire,* no. 19888. COTYPE. Fish Lake, Sevier Co., Utah, *Maguire,* no. 19882; channel north end, Fish Lake, Sevier Co., Utah, Aug. 24, 1938, *G. H. Jensen & L. Dargan,* no. 201.

This interesting dwarfed population is known only from Fish Lake, Utah, but there occurs in abundance and with remarkable uniformity of size, habit and habitat. All of the plants vary between 2–4 cm., rarely 5 cm. in height, and grow in a narrow zone of sand-gravel bottom in water from 6–12 in. in depth. Prolonged search failed to reveal plants growing in deeper water or different habitat. Dr. R. T. Clausen (1940), competent student of *Najas*, who recently visited Fish Lake, and there studied the plant under field conditions, wrote, "Field observation of the plants strengthens my opinion that the population in Fish Lake is part of the collective species, *N. flexilis*, but I now incline more than ever to regard it as worthy of subspecific status."

*Najas guadalupensis (Spreng) Morong, locally common, shallow water with *Sagittaria cuneata*, *Zannichellia*, and *Chara*, pool, south end Oxbow Pond, ½ mi. s. Smithfield Sugar Refinery, Cache Co., Utah, Oct. 10, 1940, *Maguire*, no. 20198.

This species has apparently not previously been known from the entire Great Basin-Intermountain Region (Clausen, 1936).

Najas marina L., warm (80°–84° F.), hard-water springs, to 3 ft., growing on sandy bottom, Fish Springs, Juab Co., Utah, *G. H. Jensen & L. Dargan*, no. 203.

Recently additional material, but in condition too far disintegrated to preserve as record, has been submitted from Locomotive Springs, Box Elder Co., Utah.

Clausen (1936) gives the locality of the then known collection of *N. marina* as "Central Utah." Although the original collection from Utah may thus have been from one of the two stations recorded above, there now exists two definite localities for the species. In all probability it is of more widespread occurrence in the warmer and somewhat saline spring waters of western Utah.

*Lilaea subulata H. B. K., in wet soil at edge of pond, vic. Shoshone Ranger Station, Minidoka National Forest, Twin Falls Co., Ida., *R. K. Gierisch*, no. 780.

This remarkable collection is apparently the first recorded for interior Western America. Its range hitherto has been known only from the Pacific Coast region, extending from British Columbia to South America. Muenscher (1938) has recently discussed the distribution of this aquatic.

ANACHARIS CANADENSIS (Michx.) Planchon, shallow water in pond, 2 mi. N. Oxford, Bannock Co., Ida., Sept. 18, 1932, *Maguire*, no. 3194; common, in water 6–12 ft. deep, Fish Lake, 8600 ft., Sevier Co., Utah, Aug. 25, 1938, *Maguire*, no. 16221; abundant, shallow and deep water, State Reservoir, Logan Canyon, vic. Logan, Cache Co., Utah, Oct. 18, 1940, *Maguire*, nos. 20262, 20263; common in water 6–15 ft. deep, Strawberry Reservoir, Wasatch Co., Utah, July 8, 1938, *G. H. Jensen & L. Dargan*, no. 87.

Tidestrom (1925) cites *A. canadensis* only from Panguitch Lake, Utah.

All specimens cited herein are deposited in the Intermountain Herbarium, Utah State Agricultural College.

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UTAH STATE AGRICULTURAL COLLEGE

POLYGALA VULGARIS NEW TO THE NORTH AMERICAN FLORA.—This odd little plant, *Polygala vulgaris* L., was found growing wild at Comox, Vancouver Island, British Columbia, in May, 1941, and referred through Mrs. L. Planta to the Provincial Museum, Victoria. My identification was confirmed at the Gray Herbarium, Harvard University, by Bernice G. Schubert. Professor M. L. Fernald, the Director, also informed me in a previous letter that its occurrence in the wild state in North America was at that time unknown. Mrs. Planta states that "it was growing on a grassy bank by a roadside forming part of a field that had been seeded down with imported seeds," most probably of European origin, where *P. vulgaris* occurs in abundance.

The genus is well represented in North America in the more southerly and eastern parts, a few species extending into eastern Canada. As *P. vulgaris* is the type of the genus it is not without a certain prestige on that account. Its reaction to the new environment will be closely studied. Fortunately it brings with it no bad name as a weed.—G. A. HARDY, Provincial Museum, Victoria, British Columbia.

CYTOLOGICAL BASIS FOR SPECIFIC SEGREGATION IN THE SEDUM NEVII COMPLEX

J. T. BALDWIN, JR.[1]

WITH reference to *Sedum Nevii* Gray, Wherry (1935)[2] wrote: "The best evidence at present available indicates the real range . . . to be from central Georgia to Alabama, southernmost Illinois, easternmost West Virginia, and central Virginia."[3] Cytological study of plants of this complex from Alabama and from Virginia has revealed chromosomal differences of specific magnitude.

In early April of 1937 Dr. A. V. Beatty sent the writer flowering, living specimens of a sedum—supposedly of *S. Nevii*—from Pratt's Ferry Bridge, Bibb County, Alabama. They differed in appearance and in chromosomes from *S. Nevii* as the writer knew the species in Virginia. Some of Beatty's plants were transmitted to R. T. Clausen of the Bailey Hortorium, where they were accessioned as number C 108. Concerning this sedum, Dr. Clausen, in a letter of May 25, 1937, wrote: "It is a puzzling specimen, which seems most nearly related to *Sedum Nevii*, from which it differs, however, in flower size, shape of leaves, sterile shoots, and markedly in habit"; he gave the plant provisional nomenclatorial designation as a variety of *S. Nevii*.

Accompanied by Dr. Roland M. Harper and Dr. Beatty, the writer, on July 17, 1940, visited the above station in Bibb County.

[1] Supported by Faculty Research Fund of the University of Michigan, Project No. 540.

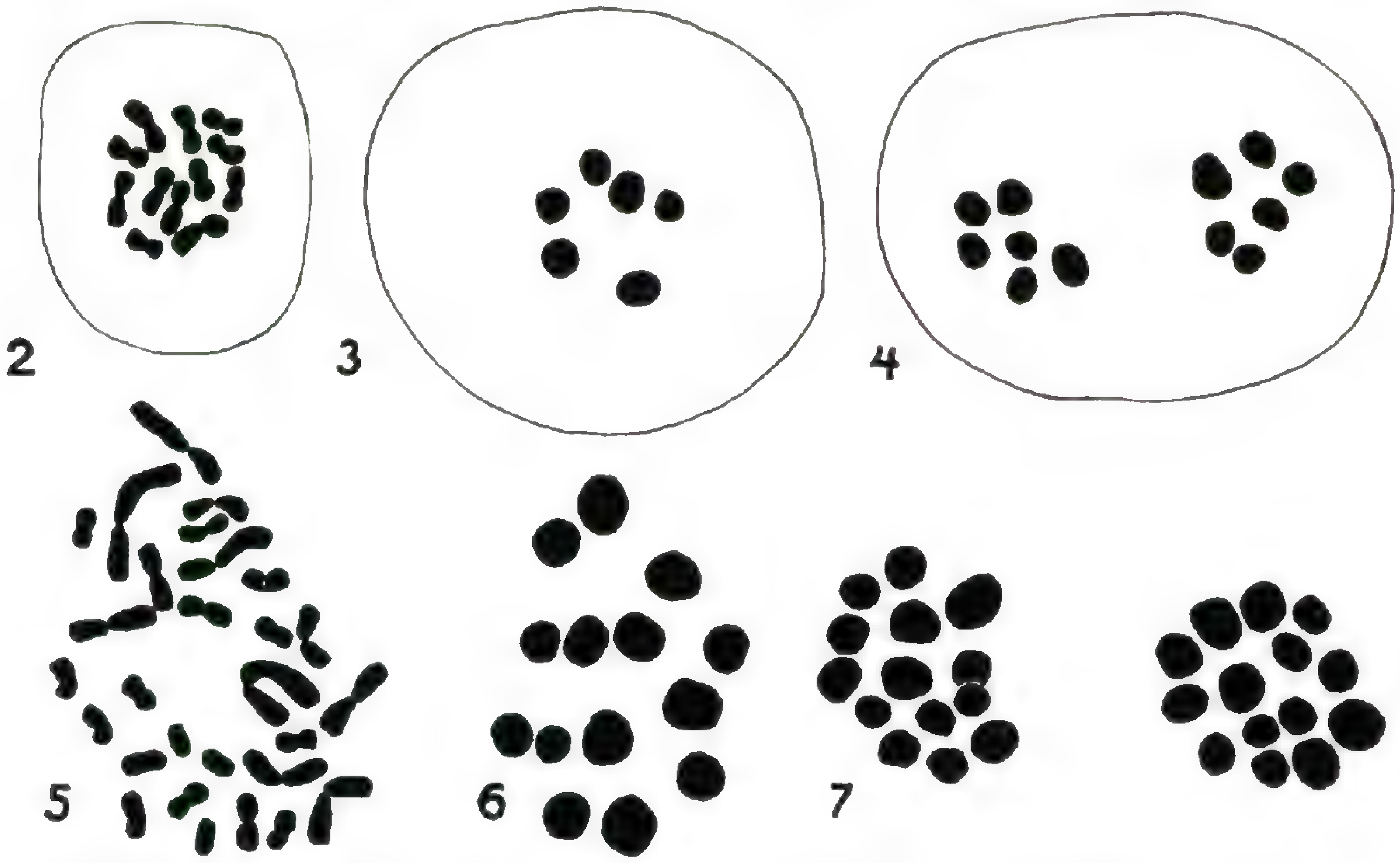
[2] Wherry, E. T. 1935. The ranges of our eastern parnassias and sedums. Bartonia No. 17: 17–20.

[3] The writer has collected tetraploid plants of *S. pulchellum* Michx. at Cobden, Union County, and at Sanburn, Johnson County, Illinois. Since juvenile stages of this species are often confused with the *S. Nevii* complex, Illinois records for the latter are most likely based on collections of the former. The *S. Nevii* complex apparently does not extend westward out of the Appalachian Mountains.

Photo. Dr. Ralph Bennett

Fig. 1, Sedum Nevii: flowering plant from Alabama, *ca.* 0.5×

There the sedum grew in matted clumps on damp limestone ledges and on mossy tree-trunks to a distance of about two feet above ground. Growing there too were *Acer leucoderme* Small, *Quercus Durandi* Buckl., *Croton alabamensis* Smith, *Asclepias verticillata* L., *Sedum ternatum* Michx., *Smilax* sp., *Euphorbia* sp. and *Vernonia* sp. The following day we found the sedum in Tuscaloosa County, in the first ravine below lock 13 on the west bank of the Warrior River, about eight miles from Tuscaloosa. Associated with the plant, or nearby, were, among other species:



Mitotic and meiotic metaphases of the SEDUM NEVII complex. FIGS. 2–4, Alabama plants: $2n = 12$ in root-tip cell; $n = 6$ at first and second metaphase of microsporogenesis. All *ca.* 1330×. FIGS. 5–7, Virginia plants: $2n=28$; $n=14$. All *ca.* 3330×.

Neviusia alabamensis Gray, *Illicium floridanum* Ellis, *Croomia pauciflora* (Nutt.) Torr., and *Polymnia laevigata* Beadle.

The sedum was transplanted from these two stations to the University of Michigan Botanical Gardens. Specimens at one station looked different from those at the other but after a few weeks in the greenhouse could not be told apart. They flowered during March and April of 1941 (FIG. 1). The chromosomes were counted in aceto-carmine smears of root tips and of anthers: $2n = 12$ (FIG. 2), $n = 6$ at first (FIG. 3) and at second (FIG. 4) metaphase.

The Virginia representatives of this complex are what is usually called *S. Nevii*. Whether the name is properly applied

to them or whether it should be reserved for the species as found in Alabama is a matter for the taxonomist to decide.[1] Plants from three stations in Virginia have been investigated: Boyce, Clarke County; Roanoke, Roanoke County, and Mountain Lake, Giles County. Chromosomes of these plants were examined in smears of roots and anthers: $2n = 28$ (FIG. 3), $n = 14$ at first (FIG. 6) and second (FIG. 7) metaphase. Plants growing on different boulders at Mountain Lake varied somewhat in aspect but became alike under greenhouse culture; no differences in chromosomes were established.

If the Alabama and Virginia plants were euploid in relation to each other, *i. e.*, 12–24 or 14–28 in $2n$-numbers, and the chromosome set in each was morphologically comparable, the writer would not take the initiative, in spite of obvious phenotypic dissimilarities, of saying that two species are present in the *Sedum Nevii* complex. But the $2n$-number relationship is 12–28, and the chromosomes of the two sets are likewise unlike in size-range and in morphology. Two species are represented: many unpublished cytological data on *Sedum* support this conclusion.

To discover in this complex plants with a $2n$-number of 24 would not be surprising: their existence is here postulated; if found, it is expected that they will be referable to the species of which the Alabama plants are members.

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THE DISSEMINATION BY ANTS OF THE SEEDS OF BLOODROOT, SANGUINARIA CANADENSIS

BURTON N. GATES

IN RHODORA[2], reference was made to the observations of Dr. E. B. Southwick[3], who had seen ants carrying the seeds of

[1] *Sedum Nevii* Gray was briefly described by Asa Gray in Mem. Am. Acad. n. s. vi. 373 (1858), from a specimen sent by Rev. R. D. Nevius from along cliffs near Tuscaloosa, Alabama. In 1860 Chapman, Fl. So. U. S. 150, acknowledging in his preface the coöperation of Gray, gave a fuller description of *S. Nevii* from the Tuscaloosa material of Nevius; and in Gray, Man, ed. 5: 172 (1867) Gray included the plant of Salt Pond Mountain, Virginia under *S. Nevii*. True *S. Nevii* is, therefore, the Alabama plant.—EDS.

[2] BURTON N. GATES. Dissemination by Ants of the Seeds of *Trillium grandiflorum*. RHODORA, Vol. 42, No. 479, 1940, p. 196.

[3] As told by Dr. William Morton Wheeler. Ants, 1910, p. 315.

Bloodroot, *Sanguinaria canadensis* L., and feeding on their caruncles. Since this behavior is closely related to the reaction of ants toward seeds of *Trillium grandiflorum*, as reported by the author[3], parallel observations have been made with the Bloodroot seeds.

These seeds have a pronounced caruncle, suggestive of a cock's comb, mounted as a crest on the seed. Differing from the caruncle of the Trillium seed, which is spongy and somewhat viscous, that on the Bloodroot seed is dry to the touch, elongated like a sausage, but with slight constrictions giving the caruncle a crinkled, wavy appearance. Transparent, filled with a firm gelatinous material which has no apparent taste to humans, it is approximately one-third the volume of the seed. The containing membrane is highly lustrous, resembles cellophane marked with milky-white, translucent blotches. Unlike Trillium seeds, which ants gnaw out of the capsule when it falls to the ground, Bloodroot seeds, being dry, rattle from their long tapering pod upon dehiscence.

Seeds were found to be ripe and falling, June 12, 1941 (Worcester, Mass.). When first observed, ants were roving beneath the plants, where a dozen or more of the bright, polished, red-orange seeds had fallen. Their color is almost identical with that of the juice exuded by the stems. However, it was impossible to detect that the ants were paying any attention to the fallen seeds. It was probable that some seeds had already been carried off by the ants, inasmuch as there remained too few seeds in relation to the opened seed-pods.

Freshly gathered Bloodroot seeds were then offered indiscriminately to ants found about the grounds, including some near the Bloodroot plants. In nearly all instances the ants were interested at least in biting the caruncle. Ants too small to carry a seed, mounted it and gnawed at the caruncle. A few ants were dropped into a small dish of collected seeds; they frantically tried to carry them off.

Fresh seeds were then offered at random to a series of ants, in order that those making positive reaction might be collected for identification. At one station, although a number of ants were

[3] Ibid and also in the sequel, Observations in 1940 on the Dissemination by Ants of the Seeds of *Trillium grandiflorum*. Rhodora, Vol. 43, No. 509, 1941, p. 206.

offered a seed, some merely crawled over it and hesitated; nearly all turned toward it and showed some interest in it. None of these ants, however, picked up the seed, although they were large enough to have done so. There was indication that the ants reacted less quickly and precipitously to the Bloodroot seeds, in some instances, than they did to the Trillium seeds in the 1939 and 1940 experiments.

Twelve ants, however, made prompt, positive reactions, usually dragging away the seed; these ants were collected and identified[1]. The twelve specimens comprised three species: the largest, *Formica neogagates*, the middle sized, *Myrmica emeryana*, the smallest, *Lasius americanus*. *Lasius americanus* is the only species which was also a positive reactor to the *Trillium grandiflorum* seeds[2] in 1940.

The Bloodroot plant, like the Trillium, has no mechanical means of disseminating its seeds. Dissemination is apparently effectively accomplished by ants which respond to the lure of the caruncle. Strasburger[3] accounts for the attractiveness of this lure to ants by the presence of an abundance of oils, explaining "the distribution of certain seeds by ants . . . , attracted to remove and accumulate the seeds, by the abundance of oil in the elaiosome-containing tissue of the appendages, such as the caruncle."

Massachusetts Department of Agriculture,
State House, Boston, Mass.

Euphorbia glyptosperma in Massachusetts.—In the routine work of identifying plants received by a department of Botany, one occasionally chances upon a specimen of more than ordinary interest. Such was a lawn weed sent in recently by Mr. T. A. Bachand of Huntington, Massachusetts, and which we identified as *Euphorbia glyptosperma* Engelm. Through the kindness of the Gray Herbarium the specimen was submitted to Dr. L. C. Wheeler who recently contributed to Rhodora a revision of the *Chamaesyce* section of *Euphorbia*. Dr. Wheeler

[1] All identifications were made by Mr. Lawrence G. Wesson, Jr., Boston, Mass., whose kindness is much appreciated.

[2] Ibid., Rhodora, 1941.

[3] Strasburger's Text-book of Botany. Fifth edition, by Dr. Fitting and others. 1921. p. 586–7.

writes us: "So far as I have any record this is the first collection of the species in Massachusetts, but in view of its general wide range and its occurrence in adjacent states, its presence in Massachusetts is not surprising."

Mr. Bachand responded graciously to a request for additional material by sending us some thirty plants, of which about one-third were the common *Euphorbia maculata* L. So the two species were apparently growing in close association.

Sheets have been deposited in the Gray and the New England Botanical Club Herbaria, also at the National Herbarium in Washington and at the Massachusetts State College.—R. E. Torrey, Massachusetts State College, Amherst.

PINELLIA TERNATA IN BROOKLYN, NEW YORK

Mary-Elizabeth Pierce

To the lengthening list of exotic plants which seem able to maintain themselves adventitiously in eastern United States should be added *Pinellia ternata* (Thunb.) Breitenbach, a member of the Araceae widely distributed in China and Japan. The ternately dissected leaves, about eight inches high, and the slender, typically aroid flower-stalk, ten to twelve inches long, arise from a brittle, subterranean rhizome. Bulblets are produced on the leaf-stalk, both below the ground line and at the joining of the leaflets. These bulblets sometimes sprout into young plants before they fall from the parent stem. The colony at the Brooklyn Botanic Garden was discovered in August of 1941 on a grassy bank near a brook. It covers several square feet and seems to be well established. In fact, we suspect that this is not its first year with us and wonder how long it has escaped notice. With its bulblets and root-stocks it seems able to make itself thoroughly at home. The plants were in flower about the tenth of August. Just how the plant was introduced is quite a mystery, since no new planting has been made in that area for at least five years. In the National Herbarium there is a specimen labeled *Pinellia tripartita* collected in Golden Gate Park, San Francisco, in May of 1935, "accidentally introduced." This specimen closely resembles our plant and from the published descriptions there seems to be very little difference be-

M. Purdy del.

PINELLIA TERNATA, about ½

tween the species. There is a possibility that *Pinellia ternata* might be of some use as a ground-cover, but the writer would hesitate to plant it in competition with any horticultural treasure. Since the species does not seem to have been adequately illustrated, Miss Purdy has kindly made the accompanying drawing.

BROOKLYN BOTANIC GARDEN

TWO PLANTS NEWLY ADVENTIVE IN NORTH AMERICA

E. J. ALEXANDER

Two interesting east Asiatic plants have made their appearance within the last few years in the local area around New York. Since neither has been cultivated in the United States, they are clearly adventives, and show evidence of persisting as newcomers to the flora of North America.

In June of the present year, when the writer was giving a lecture on wild flowers to the Flushing Garden Club, one of the club members, Mrs. Ralph Stoddard, brought up a specimen of a creeping, vine-like plant with dandelion-like flowers which had appeared in her lawn and persisted there several years. No one had ever seen anything like it, nor could they identify the plant. Upon dissection of one of the flower-heads the plant was found to be a species of *Lactuca.* Checking through that genus it was found to be *Lactuca stolonifera* (Gray) Maxim., native in Shantung, the Corean Archipelago and Japan. The habit of the plant is totally unlike our familiar lactucas. It is a delicate creeper, rooting at the nodes and sending up 1–2-flowered peduncles 8–10 cm. tall, the heads about 2.5 cm. across in flower. The leaf-blades are 1–2.5 cm. long, ovate, entire, pale green, glaucous beneath, on long, slender petioles, the entire plant glabrous. The only station so far recorded is in Flushing, N. Y. but the plant may appear elsewhere. A specimen has been deposited in the herbarium of the New York Botanical Garden.[1]

The second plant is equally interesting. In July, 1937, Mr. Robert W. Storer sent to the New York Botanical Garden a

[1] *Lactuca stolonifera* was brought to the Gray Herbarium in June, 1939, by Mrs. Stillman P. Williams, as "a pest" in a garden at Media, Pennsylvania.—EDS.

sketch of a strange aroid that was well established in a rhododendron and azalea planting at the railroad station in South Orange, New Jersey. The sketch suggested *Arisaema Dracontium,* but the flowering season was too late and the plant too small, so a specimen was asked for, which Mr. Storer sent in August. The plant was then identified by Mr. Joseph Monachino as *Pinellia ternata* (Thunb.) Breitenb., native of China, Corea and Japan. A second specimen was received later, also from New Jersey, but no record of it was kept. Recently, the writer was shown a weed that had appeared in rhododendron plantings in the Brooklyn Botanic Garden. No flowers had been seen on this plant, but it had a strange habit of forming bulbils at the apex of the petiole between the three leaflets and also out of the lower groove of the petiole. A careful comparison of the leaf-venation, and of the petiole and bulbil-structure indicated that this plant was also *Pinellia ternata,* and subsequent flowering confirmed it. This plant has been recorded as an escape in several botanic gardens in Germany, but its source of introduction to this country is a mystery, although it may have come in the form of seed in imported peat-moss. It is possible that further records of it may be obtained by a search of rhododendron plantings in various localities. The flowering period so far recorded is from late June into August. *Pinellia ternata* resembles a miniature Jack-in-the-pulpit when not in flower, but the leaves are closely crisped-undulate on the margin. The flower-structure is very different. The spathe is slender, the base of the spadix adnate to it on the dorsal side, with pistillate flowers only on the free side, the spathe then constricted for a short distance, the spadix bearing staminate flowers on all sides above the constriction and terminating in a long-tapering, purple and green tail. The plant, however, may be recognized at any time by the several-scaled, red-streaked bulbils between the leaflets and on the petioles.

New York Botanical Garden

Carex typhina in Maine.—On August 26, 1940, the writer was exploring the shores of Wayne Pond or Androscoggin Lake which lies partly in Leeds, Androscoggin County, Maine, and partly in Wayne, Kennebec County. The particular object of the search was *Nyssa sylvatica* which had been reported in that region years before. Two small trees of this species were found.

However, on the westerly shore of the lake a Carex was found which looked unusual. This proved to be *Carex typhina* Michx., which Prof. Fernald tells me has not previously been known east of the Connecticut Valley. On further search in the section known as the "Cape", where the Dead River has made a long tongue of land running into the Lake for a mile, a second station for the Carex was found. Both stations are in Leeds, Androscoggin County, Maine.—Ralph C. Bean, Wakefield, Massachusetts.

A purple-flowered Form of Cornus canadensis.—Prof. Fernald recently reported the form with purple involucres from North America. The corresponding form in Asia was, however, published by Prof. Miyabe and Dr. Tatewaki from Saghalin in 1937 under the generic name, *Chamaepericlymenum.* So the following combination is necessary under *Cornus.*

Cornus canadensis L., f. **purpurascens** (Miyabe et Tatewaki), comb. nov. *Chamaepericlymenum canadense* f. *purpurascens* Miyabe et Tatewaki in Trans. Sapporo Nat. Hist. Soc. **15:** 43 (1937). *Cornus canadensis* f. *rosea* Fernald in Rhodora **43:** 156 (1941).—H. Hara, Tokyo Imperial University.

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SOME HISTORICAL ASPECTS OF PLANT TAXONOMY[1]

M. L. Fernald

I have decided to speak to you today upon Some Historical Aspects of Plant Taxonomy, not because I am a historian but because of the imperative need of clearer understanding of our dependence on historical factors in proper interpretation of our floras and their component genera and species. The good old subject, natural history, in its very name seemed to imply something of this sort; but, as the late William Morton Wheeler so often lamented, natural history is out of fashion. I wholeheartedly subscribe to his opinion, for it so happens that I hold the title, so long made famous by Asa Gray, of Fisher Professor of Natural History. When, in the first half of the last century, that professorship (originally the Massachusetts Professorship of Natural History, founded in 1805) was established, the field of its incumbent was defined as including the organization of a botanic garden, the teaching of botany and entomology (with botany mentioned first) and the collecting of "all specimens in mineralogy . . . and after arranging them he shall deposit them in the Cabinet of Mineralogy belonging to the Corporation of Harvard College."

That was natural history indeed. Forthwith many of our colleges had professors of Natural History, who taught botany

[1] Vice-Presidential address delivered before Section G, American Association for the Advancement of Science, and affiliated Societies, at Dallas, Texas, December 30, 1941. In the absence of Professor Fernald, read by Professor Samuel W. Geiser of Southern Methodist University, Dallas. Publication in Rhodora as additional pages made possible through a gift from Mr. Bayard Long.

and zoölogy, with geology and mineralogy on the side. But the term and its full implication soon got lost; "biology" elbowed them out and more and more in too many of our institutions biology has become animal physiology and anatomy, with a partial recognition of plant anatomy and physiology and a smug indifference to taxonomy and the other interests which formerly constituted natural history. Section G of the American Association and its young daughter, the Botanical Society of America, as well as its numerous smaller granddaughters, have honorable titles, distinguished histories and sufficiently extensive fields of endeavor. May they maintain their autonomy and never become mere stepchildren of "biology". And what of the museums of Natural History? Many of them, still clinging to the old term natural history, have unblushingly divorced botany from their field of activity, natural history to them, like biology to many others, meaning merely the study of animals; and, absurdly enough, the term Natural History to some people, who have never seen over the boundary-fence which so often isolates the so-called humanities, seems to be thought of as a branch of human history. As a Professor of Natural History I regularly receive announcements and circulars from numerous historical organizations; and within three years I have been invited to prepare and present at an international conference, sponsored by our State Department in Washington, an original contribution in the field of political history.

But to come to my main theme. Plant taxonomy or systematic botany is coming back. More and more those whose botanical training ignored or overlooked this fundamental field are asking: "What is this plant; how can I find out what it is?"; and are giving concrete evidence of leaning, at least, on systematic botany. With this recent awakening to the importance and the great human interest of knowing at least by name and by superficial characteristics the common plants about us, the student is bound to ask: "Why do plants have Greek, Latin or latinized names? Why aren't the English names good enough?" He then will soon ask: "Why do you taxonomists often use different names for the same plant? Why, for instance, do Britton and Small call the bleeding-heart *Bicuculla,* while others call it *Dicentra;* why do the first two botanists call the tick-trefoils

Meibomia, others calling them *Desmodium*?" And above all, "Why do so many taxonomists disguise what they mean in describing new species by using 'dead' Latin; isn't living English the official language in the United States?" These are healthy questions. The answers to them should be clear.

One of the elementary interests of man has always been the classification in his own way and the naming of the natural objects around him. The peoples of all races have such classifications and names. It was natural, then, that among the earliest classical writers some should have turned their attention to plants and animals. It follows, therefore, that many of the names still current in botany date back to Pliny (23–79 A. D.), Dioscorides (first century A. D.) or Theophrastus (370–285 B. C.). Their viewpoint was largely that which after the Middle Ages become known as the "doctrine of signatures". These old names of plants, consequently, often reflect a supposed resemblance to some part of the human body, man, of course, being the animal most familiar to man. Several such names, unfortunately, cannot be literally translated in mixed society and my distinguished predecessor, Asa Gray, appending brief derivations of generic names in his *Manual*, coined for such names the naïve explanation "meaning recondite"! What would more certainly lead the true inquirer to his classical dictionaries?

Gray lived in the Victorian era. Nevertheless, in my student-days, listening to lectures on the fine arts by a professor who got his ideas chiefly from John Ruskin, I, as a devout young botanist, was forced to listen with tolerance to scathing remarks, by one who knew little about them, regarding the indecencies of plant-names, just as if nothing shocking is ever tolerated as art. Some years later, when a proposition was before the Harvard Faculty of Arts and Sciences to require all undergraduates to take at least one course in each of the major fields of learning (omitting botany and zoölogy), I urged the importance for everyone of some understanding of the principles of biology. My plea was promptly but unsuccessfully met by a professor of romance literature, he urging that biology is an immodest subject, as Ruskin had already shown.

We are gathered as workers and students in this vast field of botany and at the risk of shocking the finer feelings of the ghosts

of Ruskin, his former American disciple and the specialist on romance literatures, I propose to start with ancient names of plants having to do with generation of the human species and thence to refer briefly to the historic or traditional backgrounds of names which we all know. One of the most famous aphrodisiacs of all time has been the Mediterranean genus *Mandragora*, the mandrake. Its fame was so general that it found mention in the Old Testament. From the volumes of literature upon its supposed properties I quote a mild passage of the 16th century: "The roote is long, thick, divided . . . into two or three parts, resembling the legs of a man . . . There have been many ridiculous tales brought up of this plant, whether of olde wives or some runnagate surgeons or physickmongers, I know not (a title bad inough for them!) . . . They adde further, that it is never or verie seldome to be founde growing naturally but under a gallows, where the matter that hath fallen from the dead bodie hath given it the shape of a man; with many other such doltish dreames. They fable further and affirm, that he who woulde take up a plant thereof must tie a dogge thereunto to pull it up, which will give a great shrike at the digging up; otherwise if a man should do it, he should certainly die in short space after: besides many fables of loving matters, too full of scurrilitie to set forth in print, which I forbeare to speake of." The 16th century herbalist, however, was not content to stop there; he promptly added: "He that would know more hereof may read that chapter of doctor *Turner* his book concerning this matter."

Many museums of zoölogy or of medical science and anatomy display to an intelligent or unintelligent public a model of an infant in the mother's womb, with head and feet near together. We are, therefore, inevitably reminded of that large genus of plants of tropical and temperate regions, the birthworts, *Aristolochia*. This generic name, from two words meaning *best delivery*, came down at least from Pliny. It is nearly 2000 years old (probably older since of Greek origin and presumably borrowed by Pliny) and it was given because the Mediterranean species has the large calyx bent back, with summit and base together. The plant was, consequently, supposed to have been indicated by the Creator as an aid in child-birth. Neither the name nor its origin is now considered shocking; to Ruskin they were beyond the

pale. They are really most interesting, as opening our eyes to a curious philosophy of the past, which was the basis of much medical practice. The modern drug-store has on its shelf mandrake pills, although it is toward 3000 years since the plant gained its initial reputation.

Other familiar old generic names reflect the supposed generative (I mean no pun) powers of the plant; while still others reflect its supposed origin. The Mediterranean and oriental *Adonis* of the *Ranunculaceae* is credited with having sprung from the blood of the youthful lover of Venus, who, torn to shreds by a wild boar set upon him by the jealous Mars, was changed by Venus into the herb which annually springs into bloom. Similarly *Anemone*, with many red-flowered species in Asia Minor, commemorates *Na'man*, the Semitic equivalent of Adonis.

Still others of the ancient generic names were based upon resemblances to human organs, to diseased conditions or, in some cases, to familiar animals or their obvious characteristics. To this group belong *Chelidonium*, *Dracontium*, *Paronychia*, *Saxifraga* and *Juglans*. *Chelidonium*, swallow-wort, is a quick-growing small poppy with saffron-orange latex. According to Aristotle (384–322 B. C.) and other ancient scholars, the mother-swallows gather this herb and strengthen the sight of their young by painting the eyes with the orange juice. If you doubt the accuracy of Aristotle, Theophrastus and Pliny, examine a swallow's eye. You will there find the orange or yellow ring! *Dracontium*, for which our green dragon, *Arisaema Dracontium*, was named, has a long spadix projecting from the spathe, like the tongue of a dragon or serpent; a piece of dragonroot carried in the pocket was thought to keep away venomous beasts. *Paronychia* has dry chaffy scales and bracts like dry fingernails; it was, therefore, the reputed cure for the disease of the nails known as paronychia or, in English, whitlow, whence the colloquial name, whitlow-wort. *Saxifraga granulata* and related species bear small pebble-like grains and bulblets about the base, other species having them in the inflorescence. Consequently, by the inevitable ancient philosophy, they were a cure for calculi: "the root boiled in wine and drunken, breaketh the stone and driveth it forth." *Juglans* (the walnut), a name used by Cicero and others, is a contraction of *Jovis glans*, the nut of Jove, be-

cause of its supposed great power, as clearly indicated by the corrugated and folded flesh of the nut, resembling the human brain, in curing weakness of the brain and insanity. In these modern times the connotation of the word "nut" has become reversed. We should be cautious, nevertheless, about jeering at those modern faddists who live chiefly on nuts.

After the classical period and through the Middle Ages the study of botany suffered along with other learning; but with the Renaissance and perfection of printing learned doctors, chirurgeons and apothecaries, in addition to priests, monks and some country gentlemen, entered the field, and the sumptuous volumes, often beautifully illustrated and printed and larger than the traditional family bible, attest their zeal. To a great extent these students of the 16th and 17th centuries derived their matter from the ancient writers, but some of them showed marked originality. In these brief comments we must pass those centuries, until the publication in 1700 of the great work of Tournefort, *Institutiones rei herbariae.* In this monumental work, Tournefort, assembling from past students great volumes of condensed information, attempted for the first time on any such scale definitions of all recognized genera of plants, with concise and clear diagnoses, bibliographic references and drawings illustrating the diagnostic characters of the genera as understood by him. Tournefort, unfortunately, followed the universal polynomial nomenclature of his time, with each species designated by a long descriptive phrase. With the rapid advance in the science such long phrases became cumbersome and it was a great contribution of Linnaeus, that he reduced these descriptive phrases of the species to a single selected specific name, this, combined with the generic name, giving us the binomial, now in general use. Linnaeus accepted many of the genera as defined by Tournefort, citing the latter's diagnoses and figures. In interpreting such genera, taken over by Linnaeus directly from Tournefort, it is necessary to go back to the latter author. In other cases Linnaeus derived his generic names and their diagnoses from predecessors other than Tournefort and, of course, he coined many names himself and gave for them original diagnoses.

Since, by general agreement at international congresses, the nomenclature of plants begins with Linnaeus in 1753, the plant

taxonomist wisely stops in his backward search for interpretations with that date, except in cases where Linnaeus based his genera and species primarily on the work of earlier authors. This is fortunate, for in too many cases the older authors left no adequate specimens by which their descriptions and names can be checked; even the names of Linnaeus, whose great herbarium belongs to the Linnean Society of London, are frequently subject to different interpretations. Of that more later.

Returning to the origins of the names. The authors down to and including Tournefort and Linnaeus naturally accepted many generic names, such as *Calla, Iris, Myrica, Cannabis, Morus, Ulmus, Celtis* and *Cercis*, from classical writers, others from botanists of the 16th and 17th centuries, and inevitably coined many themselves. As interesting as any, taken over from Pliny and Virgil and perpetuated to our present time, is *Cornus*. In English we call it dogwood, as if it has some association with dogs; but the derivation of our English name seems to have been directly through the Latin generic one. *Cornus*, the ancient name, from *cornu*, a horn, referred to the hardness of the wood, a European species having long been used for skewers by butchers and for daggers and other sharp implements, whence the colloquial names in some English provinces, skewerwood and *dagwood*, the latter coming from the Old English *dagge*, a dagger or sharp, pointed object. *Cornus* and *dagwood* are, then, apparently closely related in meaning, and only by an erroneous etymology did dogwood become established as the English name of *Cornus*. It would be as pedantic to urge the abandonment of "dogwood" for *Cornus* as to insist that *Erythronium* shall not be called "dog-tooth violet." Those purists who insist that this name should be abandoned because *Erythronium* is not really a violet apparently lack human souls; they are merely tedious bodies and intellects. In ancient usage the term "violet" was applied to many showy spring-flowers, whether or not they belonged to the genus *Viola*. One of the ancient "violets" of the Mediterranean region and central Europe is *Erythronium Dens-canis, Viola Dens-canis* of the ancients, literally dog-tooth violet, because of the white and pointed ovoid bulb suggesting the eye-tooth of a dog.

All that I have thus far said concerns the folk-origin or the

ancient philosophic background of classical names of plants. To the extreme literalist many such names, based upon demonstrably erroneous assumptions, are misleading; to those who still cherish Santa Claus they are full of literary and historic connotation. At any rate the usually very mechanical international rules of botanical nomenclature insist on the retention of such old names as were maintained by Linnaeus in 1753. Coming back to consideration of the genera and species taken over from earlier botanists or first defined by Linnaeus, we find that he had a keen appreciation of the historic or mythological bases of names and their frequent folk-origin. To be sure he coined some which are descriptive, *Eriophorum* (bearing cotton or wool), *Alopecurus* (a fox's tail) and *Celastrus* (commonly evergreen); but when compared with such latter-day names as *Cynoglossopsis*, *Abromeitiella*, *Pseudoëpostoa*, *Haageocactus*, *Asta* of the *Cruciferae* (in Yankee pronunciation not distinguishable from the venerable name *Aster* in the *Compositae*), and *Saintpauliopsis*, even the more matter-of-fact names of Linnaeus become poetry.

Linnaeus wrote at great length upon the philosophy of botany and he had a strong contempt for malformed and hybrid names. His own (except a few barbaric ones taken over from non-Latin tongues) are models, and the keen imagination of the master was constantly at work. As a student, tramping from southern Sweden northward into Lapland, he became acquainted, on June 11, 1732, with the flesh-colored flowers of *Andromeda polifolia* and his youthful enthusiasm found exuberant expression. In his journal he wrote: "As I contemplated it I could not help thinking of Andromeda as described by the poets; and the more I meditated upon their descriptions, the more applicable they seemed to the little plant before me . . . Hence, as this plant forms a new genus, I have chosen for it the name of *Andromeda*."[1] The genus *Andromeda*, as understood by Linnaeus in 1753, was highly complex; and, forthwith, such scholarly botanists as David Don, Konrad Moench and Richard Salisbury, segregating it into its elements, followed the lead of Linnaeus and gave mythological names to the separated genera. That was as it should be; the anticlimax was American. The great manipulator of transcontinental railroads, the late Edward H. Harriman,

[1] Lachesis Lapponica, trans. J. E. Smith, I. 188, 189 (1811).

ordered by his physician to break away from his nerve-wrecking New York office, organized a yachting cruise to Alaskan waters, his invited party including botanists and other naturalists. Mr. Harriman keenly appreciated the refined beauty of the little moss-like shrub with delicate white flowers, the *Andromeda hypnoides* of Linnaeus, already separated as *Cassiope hypnoides* (L.) D. Don. Immediately, therefore, there was added a name in the group and those who maintain all the generic names proposed for species of the original *Andromeda* of 1753 must recite some of them as follows: *Andromeda, Cassandra* or *Chamaedaphne, Cassiope, Leucothoë, Phyllodoce, Pieris* and—*Harrimanella.* What taste!

One other case is of more strictly North American interest. I refer to Leatherwood, Moosewood or Wicopy, *Dirca palustris* L., the small tree-like shrub of rich woodlands of Atlantic North America. It is closely related to the Old World *Daphne,* but by Linnaeus was separated as the genus *Dirca.* The original material known to Linnaeus was collected by John Clayton along streams of interior Virginia: "Ad ripas fluminis R [o]anok dicta, aliorumque fluviorum prope montes".[1] Linnaeus, separating it from *Daphne,* consequently, with his fine feeling for propriety, took his cue from Clayton's statement of the habitat and named it for Dirca or Dirce, wife of Lycus, who, after her brutal murder, changed into the fabulous fountain Dirce. Linnaeus, however, was a better student of the classics than of English, for he rendered the English-American colloquial names: "*Anglis* Leatervoud s[ive] Mousevoud".[2]

Linnaeus delighted to honor in his generic names the outstanding and sometimes more humble botanists of his own and preceding centuries. In his *Critica Botanica* he stated that such "names formed to preserve the memory of a Botanist who has deserved well of the science I retain as a religious duty . . . I would sooner root out all generic names which do not in themselves express the essential character of the genus than one taken from the name of a Botanist who has deserved well of the science"[3]; but he did not, like some recent botanists, issue a

[1] Gronovius, Fl. Virgin. 155 (1739).
[2] L. Amoen. Acad. iii. 13 (1756).
[3] Translation of Sir Arthur Hort, The "Critica Botanica" of Linnaeus, 61, 62. Ray Society, London, 1938.

joint report with reciprocal compliments, with first a species named by no. 1 for no. 2, then one named by no. 2 for no. 1 and so on through the volume. Most fortunately, the newspaper reporter's idea that taxonomists regularly name plants and animals for themselves is rarely so nearly exemplified. Linnaeus's own characterization of the genus named for him was as follows: "*Linnaea* was named by the celebrated Gronovius and is a plant of Lapland, lowly, insignificant, disregarded, flowering but for a brief space—from Linnaeus who resembles it."[1]

In naming genera for others Linnaeus often exhibited the lively fancy so apparent in his other generic names. Two examples of these must suffice; these I have selected as belonging to genera familiar in Texas. "*Commelina* has flowers with three petals, two of which are showy, while the third is not conspicuous." Therefore, Linnaeus named the genus for three Dutch students of early date, "the two botanists called [Jan and Kasper] Commelin: for the third died before accomplishing anything in Botany."[2]

Everyone in the warmer parts of the Americas knows *Tillandsia.* It is closely covered with appressed scales which caused Linnaeus wrongly to infer that it sheds and has no use for water. With this false inference in mind he gave the generic name *Tillandsia.* It seems that a student, afterward a professor at Abo, crossed the Gulf of Bothnia by boat, to attend the university at Stockholm. He was so painfully seasick that thereafter he regularly made the journey, five times the shortest distance, overland around the head of the Gulf. Furthermore, in the Scandinavian fashion of his day, he assumed the surname Tillands, which signifies "by land"[3]. Who but Linnaeus would have grasped such a straw in seeking to name a new genus?

Occasionally, however, Linnaeus was misled, especially through the errors of others. The insistent genius of the English in anglicizing French words is proverbial. In my own wanderings in Newfoundland and southern Labrador this has been everywhere apparent. Bonne Espérance and Blanc Sablon of Cartier and other French discoverers of the region are "Bonny Spearens" and "Nancy Belong"; Griguet is "Cricket", and Le Quirpon is

[1] After Hort.
[2] After Hort.
[3] Linnaeus, Praelect. Ord. Nat. 291 (1792).

"Karpoon". So with plant-names in various parts of the world. French explorers in the West Indies called one of the trees *bois fidèle*. By the English this was interpreted as fiddle-wood (of which no one ever made a fiddle); and Linnaeus fell into the trap, coining for it the correctly latinized Greek equivalent, *Citharexylum* (fiddle-wood).

In his descriptive specific names Linnaeus was particularly happy; they have been constant models for later botanists. In his geographic adjectives applied to American plants he was less happy. In continental North America he recognized six principal areas: Canada, Pennsylvania, Maryland, Virginia, Carolina and Mexico; these he seems to have drawn by lot and forthwith applied them. His *Potentilla pensylvanica* came from Hudson Bay; his *Berberis canadensis* from the Alleghenies. And several American plants, early carried to the Mediterranean by Portuguese and Spanish explorers, were assumed to have come from the East or Southeast, while the geographic sources of others were hopelessly tangled. The commonest and endemic temperate North American milkweed is *Asclepias syriaca* L.; the Atlantic North American *Conioselinum* is *C. chinense* (L.) BSP. These, after all, merely demonstrate that the great founder of modern taxonomy was human and that he had the proverbial European understanding of American geography.

There is not time further to follow the origins of our plant-names. Nor can I tax your patience by taking up the masterly works of hundreds of founders of taxonomy. The pioneer work of Clusius, Bauhin, Morison, Ray, Plumier, Dillenius, Burmann, Gronovius, Scheuchzer, Haller, Hill, Gmelin and their contemporaries tempts the chronicler of progress in the science, as do the wonderful forward steps of Lamarck, Robert Brown, de Jussieu, the DeCandolles, Jacquin, Willdenow, Koch, Kunth, Schlechtendal, Agardh, Fries, von Martius, Ledebour, Endlicher, Alexander Braun, Eichler, Schimper, Lindley, Decaisne, Bentham, the Hookers, Gray, Boissier, Regel, Hackel, Warming, Engler, Wettstein and a host of equally great or hardly lesser masters. Contemplation of the tremendous volume of fundamental work in taxonomy done before the period of electric lights, typewriters, short-hand, automobiles, radio and movies by such profound scholars as Lamarck, Alphonse DeCandolle,

von Martius, Ledebour, Boissier, Bentham & Hooker and countless others should bring a blush at least of modesty to many of us modern workers who so obviously seek to swell the weak personal bibliography by trivial and needlessly multiplied titles.

All these we must pass; proper discussion and appreciation of their work would require many volumes. In the remaining moments, moreover, I shall restrict my examples largely to cases in the only flora I know, that of temperate eastern North America; and I shall try not to wander too far from the elementary questions propounded in my opening paragraphs.

"Why do plants have Greek, Latin or latinized names? Why aren't the English names good enough?" From the days of Pliny to those of the most modern of taxonomists the use of Latin or Greek names has been the universal practice, the great taxonomic works of Linnaeus, Lamarck, Willdenow, the DeCandolles and Bentham & Hooker upon worldwide floras, of Robert Brown on Australia, of Schlechtendal on Alaska, of von Martius on Brazil, of Gmelin or of Ledebour on Russian Siberia, and their hundreds of contemporaries and successors have been written wholly or with at least the names and technical descriptions in Latin. By common consent Latin for two milleniums has been the chosen language of scholarship; at any rate, scholars, seeking the best, have found much of it, first in Greek, later in Latin. Consequently the international rules of botanical nomenclature wisely lay down the fundamental principle (Art. 7) that "Scientific names of all groups are usually taken from Latin or Greek. When taken from any language other than Latin, or formed in an arbitrary manner, they are treated as if they were Latin. Latin terminations should be used so far as possible for new names." In general, taxonomic botanists have respected this principle, laid down by Linnaeus; but, especially in the earlier post-Linnean period, they sometimes dug up such barbarities as *Lablab;* on the other hand certain aboriginal American names, taken over for genera, like *Mayaca, Sassafras, Catalpa* and *Sequoia,* offend no one. If, as some in non-descriptive sciences so short-sightedly urge, the taxonomist, in clinging to the Latin or latinized names is non-progressive, what would they substitute? Surely a colloquial name like "cat-tail" or its equivalent in other languages is not widely intelligible. In many

parts of the United States and Canada it means *Typha;* but in Britain alone "cat-tail" has been colloquially used for aments of *Corylus* or of *Juglans*, or for inflorescences or plants in *Phleum, Equisetum, Scirpus, Echium, Eriophorum, Amaranthus* and *Hippuris.* Those who attended the International Botanical Congress at Ithaca, in 1926, will remember the session when the chairman of the excursion committee announced a trip where the party would pass an extensive "cat-tail swamp." Immediately the hundred Old World delegates looked questioningly at their American colleagues, until the Chairman of the session, the late Professor Ostenfeld, properly instructed, wrote on the blackboard: "Cat-tail = *Typha.*" Then, but only then, all was clear. A system of vernacular names is not safe in exact taxonomy.

"Why do taxonomists often use different names for the same plants?" In the earlier days of modern taxonomy most of the detailed studies were made at universities or museums of competing European nations. Naturalists of diverse interest accompanied the great exploring or naval expeditions or were sent out on botanizing missions from France, Britain, Denmark, Sweden, Holland or Russia; and the plants brought back were studied and, when thought to be new, described by taxonomists of the national institutions or by those supported by the patrons of science. With limited personal contact between the earlier workers, it was inevitable that there was duplication of names or that different names were given to similar plants; and when the Americas entered the field of descriptive botany their remoteness from workers in Vienna, Berlin, Paris, Leiden, Copenhagen and even London was a perpetual handicap.

The bleeding-hearts were generally recognized as a genus during the first half of the 19th century and in the thirty years from 1824 to 1853 no less then eleven generic names were assigned to them by workers at different institutions: *Dicentra* by Bernhardi at Erfurt in 1833, *Cucullaria* by Endlicher at Vienna in 1839, *Bicucullaria* by de Jussieu at Paris in 1840; and other names by workers in centers as remote as Lexington, Kentucky, and St. Petersburg (now Leningrad) in Russia. *Dicentra* was extensively taken up and had long been preferred, when it was discovered that one of the somewhat irregular authors of names

(so irregular that some botanists have seriously proposed legislation to outlaw his names), Adanson, had proposed for the genus in 1763 the name *Bikukulla.* This has absolute priority and those botanists, who for some years opposed the international agreement to conserve the better-known names which lack technical priority of publication, picked up Adanson's name (altering it in a manner inconsistent with their professed insistence on strict priority, to *Bicuculla*). Many such instances occur, and the leading taxonomists of the world, recognizing that strict application of the principle of priority of publication in generic nomenclature would produce needless confusion, have very wisely adopted the principle of conserving such much-used and long-established names as *nomina generica conservanda,* with hearty approval of all but the most adamant. *Dicentra* is thus conserved; so is *Desmodium* over *Meibomia.* Were these and others not so conserved we should lose many names which have long since become established in taxonomic, morphological, horticultural and pharmaceutical literature: *Spirogyra, Vaucheria, Fucus, Selaginella, Podocarpus, Agathis, Sequoia, Welwitschia, Glyceria, Spiranthes, Carya, Calycanthus, Wisteria, Ailanthus, Vernonia, Liatris* and *Zinnia,* along with many hundreds of others. How would the traditional botanical laboratories and teachers of morphology respond if, following the strict principle of priority, they were told to discard the name *Spirogyra* and take up for it *Conjugata,* to throw out good old standard *Fucus* in favor of *Virsoides,* that *Selaginella* must be called either *Selaginoides* or *Lycopodioides* (published at the same date), that *Zamia* is *Palmafilix,* that *Sequoia* must become obsolete and we must call it *Steinhauera?* For some years loud outcries arose from a minute minority against nomina conservanda. Today such protests are scarcely heard.

The principle underlying *nomina conservanda* is sound; but the detection of long-familiar names which, unless conserved, must fall, is never finished. Obscure old books and papers, previously overlooked, come to light, like many of those of Rafinesque who, during his lifetime, was so generally erratic that his contemporaries ignored or destroyed his publications. It is authoritatively stated that a saintly and profound leader in American botany of a century ago, receiving isotypes of many of Rafinesque's pro-

posed genera and species and copies of his innumerable publications, conscientiously consigned them to a bonfire as the work of the Devil. Who today would not make great sacrifices to see authentic specimens of Rafinesque's species? When, therefore, rare, obscure or overlooked old works come to light, upsets are likely to occur. Since the original list of *nomina conservanda* hundreds of other names have been suggested for conservation. These include *Setaria, Rhynchospora, Loranthus, Nama, Helychrysum* and many scores more which it would be a pity to lose. Everyone discovering a good old name in danger of exclusion will do a real service by communicating it to the Secretary of the International Commission on such names.[1]

Furthermore, the human equation comes in. Different points of view and different experiences lead to divergent conclusions. The sections or subgenera of one author are the genera of others. The genus *Pyrola* of a more conservative group of botanists is to some others a group of genera. The cytologically similar and freely hybridizing *Sorbus* and *Aronia* are to some, who lay more emphasis on habital characters, satisfactory genera. To others they are congeneric and to others only subgenera of the inclusive genus *Pyrus*. These are honest differences of judgment and no legislation will solve them.

As to the use by all considerate taxonomists of Latin in publishing new diagnoses, a brief consideration will show that any other course would be selfishly inconsiderate; incidentally such publication would be invalidated by the international rules. Latin having been for more than 2000 years the language of scholarship in all western civilization, it is inevitable that no real student of plants and their proper identification and classification can possibly get beyond the mere threshold until he makes himself at least a slight master of the language of his subject and of his long line of outstanding predecessors. He may, like many of us, be forced to overcome the deficiency of school- and college-training, and his Latin may be very unpolished and unclassical; but by imitating such masters as Haller, Linnaeus, Schlechtendal, Blume, DeCandolle or Bentham he can make himself understood. Of course some absurdities result in the descriptions by those whose Latin is as weak as their taxonomy, as, for instance,

[1] Miss M. L. Green at the Royal Botanic Gardens, Kew.

in the case of one prolific author who joyfully strung together long phrases, all in the nominative singular. Nevertheless we can guess what was intended. It has been the practice, especially among European students, to append to their diagnoses, not their own names, but the Latin "mihi" or "nobis", thus modestly indicating that they are the authors. When, however, we find the editor of a two-volume government-supported work seriously including Nobis as a significant botanical writer it is difficult to restrain a smile: "*Nobis.* Naturalista francés, que trabajó con Richard en la clasificatión de las plantas cubanas de Sagra"[1].

If we did not have occasional bits of such unconscious humor our work might become monotonous.. When, however, one witnesses the undisguised belittling of a foundation-training in Latin, as well as of any real understanding of plant taxonomy, which pervades too many of the so-called and rather assertive recent laboratories of "biology", he can only pray that scholarship or the appreciation of it may not wholly disappear from botany. I am informed that students of morphology and taxonomy are regularly encouraged to gain such insight as they can into plant physiology. How often do present-day physiologists enroll in courses in taxonomy? If all botanists sympathetically grounded themselves in the elements of the major areas of their vastly inclusive broad field, such symptomatic incidents as the following would rarely occur. A young taxonomist and morphologist, desiring to have some insight into plant physiology, was reducing to ash (for chemical analysis) a flowering plant. After thus disposing of the root, stem and leaves he asked the instructor: "Shall I burn the inflorescence?" The prompt reply was: "Inflorescence? What are you giving us? I know all about efflorescence and fluorescence, but you've pulled a new one on me—'Inflorescence'!"

The latter incident and numerous others like it indicate that some groups of biologists have not materially broadened their outlook since the famous *faux pas* of 1902. At one of the relatively youthful American universities plant taxonomy has always been denounced. This may be because the original head of the department of botany there had once made a superficial

[1] Estudios Sobre la Flora de Puerto Rico, ed. 2: 49 (1936).—Pub. Fed. Emergency Relief Administration.

plunge at that exacting field without full appreciation of its dependence on precision. At any rate the attitude of the institution was clearly expressed by one of its more outspoken botanists as follows. After elsewhere explaining that he is one of "those of broader viewpoint," he wrote: "The world of morphologists, physiologists and ecologists has borne with" the sinning taxonomist "patiently and long . . . a little more and the sinning taxonomist will be 'cast out into the outer darkness where there shall be wailing and gnashing of teeth'".[1] This critic, who, in spite of his prejudices, later became a beloved friend of many of us, has unfortunately died; I am not informed whether he is now obliged to associate with taxonomists. But to come to the *faux pas* referred to. A thesis published from the botanical laboratory of the aforementioned university seemed, on the surface, to break down the reputed characters separating the *Saxifragaceae* (with 2 carpels, etc.) from the *Rosaceae*, because the student of professors who shunned taxonomy had found 2 carpels in "*Spiraea japonica*". Very soon, however, Professor Alfred Rehder[2] pointed out the fallacy; the erroneous deduction was based, not on *Spiraea japonica* of the *Rosaceae*, but upon *Astilbe japonica* Gray, a long-recognized and quite typical member of the *Saxifragaceae*. Ho, hum!

To such wholly satisfied workers as these the use of Latin in new diagnoses seems pedantic, unprogressive and far from their conception of "biology". To those of us who have to spend weary hours checking the descriptions of new species by taxonomists the world over, it is a blessing. If the peoples writing a language of non-Latin origin all insisted upon using only their mother-tongues we should never get to a common meeting-ground. When, however, the active taxonomists of Japan, China, Russia, Czechoslovakia, Italy, Germany, Scandinavia, England, Argentina, and the United States all forego their personal convenience and conscientiously put into understandable (though often halting and imperfect) Latin their new diagnoses, we can all interpret what is meant. Otherwise there would be perpetual darkness. Modern scientific Latin is a living language and an invaluable implement.[3]

[1] Am. Nat. xlii. 270, 271 (1908).
[2] Rehder, Bot. Gaz. xxxiv. 246 (1902).
[3] In this connection we may take justifiable pride in the fact that the conservative

I now come to one of the difficult but inescapable and time-consuming duties of the exact taxonomist. In these days no careful worker ever describes a new genus, species, variety or form without designating a special individual from among those he has studied to stand as the TYPE or standard for future students. He also should, and usually does, state in what herbarium it is deposited. But until comparatively recent times phytographers did not think in terms of TYPES or single selected standard specimens; they were concerned with the whole specific or generic concept and included within it all the material they had studied, without specially designating one as outstandingly representative. When DeCandolle, Engelmann or Gray had before him dozens or scores of specimens which he put together as one species they were all considered as typical. If they had only one specimen their interpreter in later years may regard himself as unusually fortunate. Attempts to formulate as a dogmatic rule procedure in determining which of several or many specimens shall be considered the type lead to constant error. One cannot wholly project himself into the minds of past workers, but the close student of a group may select the particular specimen which seems best to represent the original author's concept. In this, however, only the close student of the group should be trusted; merely mechanical selection is too doubtful. I may illustrate by a personal experience. In 1894, assigned to identify a large collection made by the late C. V. Piper in Washington State, I detected a plant which seemed to me specifically different from *Lathyrus polyphyllus* of Nuttall. Piper's plant had few large purple flowers, few leaflets and small stipules and, after studying its relationship, I published it as *L. pauciflorus*. Picking out

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workers in American botany urged before the International Congress at Cambridge University in 1930 the retention of a requirement of Latin diagnoses for new plants. In the Proposals by the Sub-Committee on Nomenclature, appointed by the Imperial Botanical Conference and published in 1929 as the "Proposals by British Botanists", an attempt was made to weaken this requirement, the British Sub-Committee saying of their proposition (Art. 41, p. 40) "The requirement of a Latin diagnosis . . . is omitted". Subsequently, at the opening of the Congress, finding that the Japanese, Russians, Czechs, Scandinavians, most Americans and others were strongly for the retention of the Latin requirement, the British withdrew without argument their proposition. The joke was this: the dear old *London Times* editorially complimented the always scholarly British on winning their hard fight for the retention of the Latin diagnoses in the face of overwhelming opposition from the Americans and other crude peoples. So far as I could learn, this insinuation by the *Times* was never corrected.

from the herbarium two older sheets of specimens which I then identified with Piper's, I cited these in chronological order, Piper's more recent material coming last. Some years later a western student pointed out that the first specimen cited in the series was not conspecific with the others but that, since it was the first cited, it must be taken as the type. Such an interpretation, of course, was unjustified, because the description, when checked, was so evidently based upon the Piper material and so clearly excluded the plant erroneously placed with it. In this case the author of the species was able to make the decision. In case of authors of past centuries that is not possible.

When Linnaeus based a new species upon a single specimen or a single citation, the interpretation of his species is simple enough. Trouble begins, however, when he had associated with his own material descriptions of other and earlier authors. A single recently discussed case may make clear the problems we must face in selecting types for such Linnean species or genera.

The genus *Heuchera* of the *Saxifragaceae* started in 1737 almost simultaneously in the *Genera Plantarum* of Linnaeus and in his monumental *Hortus Cliffortianus*. In the former work he described the genus but in the latter he gave no description, merely citing his *Genera*, stating that it was North American and that it was named for Johann Heucher of Wittenberg; and appending references to descriptions of earlier authors which he thought to belong to his *Heuchera*. Here was the full treatment in *Hortus Cliffortianus:*

HEUCHERA. *g. pl* [*Genera Plantarum*]. 196

1. HEUCHERA
   Cortusa americana, flore squalide purpureo. *Herm. par. p.* 131. *descript.*
   Cortusa americana, floribus herbidis. *Herm. par. t.* 131.
   Sanicula s. Cortusa americana spicata, floribus squalide purpureis. *Pluk. alm.* 332. *t.* 58. *f.* 3.
   Mitella americana, flore squalide purpureo villoso. *Boerh. lugdb.* I. *p.* 208. *descr. floris.*
   Primula veris montana laciniata americana, flore squalide purpureo. *Herm. lugdb.* 506.
   Crescit in America, *forte septentrionali, cum hyemes nostras bene ferat.*
   Dixi hoc genus plantarum a Joh. Heuchero, *ex Horto Wittenbergensi claro, ejusque supplementis, in quibus varia curiosa lectuque digna exhibuit.*

Since our nomenclature begins with the publication of *Species Plantarum* of Linnaeus in 1753 we next turn to that work, in which the binomial of the type of the genus appears, as *Heuchera americana* L.

americana. I. HEUCHERA. *Hort. cliff.* 82. *Gron. virg.* 29. *Roy. lugdb.* 437.
Cortusa americana, flore squalide purpureo. *Herm. parad.* 131, *t.* 131.
Sanicula s. Cortusa americana spicata, floribus squalide purpureis. *Pluk. alm.* 332. *t.* 58. *f.* 3.
Habitat in Virginia. ♃

In the treatment of 1753 no description was given, but Linnaeus referred immediately back to his own *Hortus Cliffortianus*, in which a reference was given to the slightly earlier *Genera Plantarum.* One of the references to Hermann was omitted but a new one (to Gronovius) was added; altogether there are eight descriptions given or cited.

What is the type of *Heuchera americana?* If, in preparing his *Species Plantarum* of 1753, Linnaeus had had in his own herbarium a specimen so named by him and matching his description (published in 1737) most of us would consider the question settled. In this particular case it is not so easily settled, for the late Dr. B. Daydon Jackson, for years a close student of Linneana, has clearly indicated that Linnaeus had no such specimen. We must, therefore, get out all eight volumes in addition to *Species Plantarum* and carefully compare them. To me, at least, the plants of the Clifford Garden, which were the basis of the wonderful *Hortus Cliffortianus* of Linnaeus, are next in significance, because they were actually before and described by that author. The plants he did not personally work with are of secondary importance. Fortunately, the Clifford Herbarium, preserved at the British Museum, contains the specimen. A photograph of it strongly suggests *Heuchera hispida* Pursh, rather than the plant passing as *H. americana.* If by some it be insisted that the specific name *americana* was taken over by Linnaeus from earlier botanists and that the plants of Hermann or that of Plukenet or of Boerhaave, as bearing that epithet, should be accepted, we are worse off still. Plukenet's figure is so conventionalized that it means little; Hermann's plate and some of the old descriptions lead directly to *H. villosa* Michx. Until, after the war, we can secure good photographs or make discriminating comparisons with the old specimens upon which Plukenet, Gronovius and others based their accounts we cannot be sure what they had. If, however, we stop, as I should do, with the material which Linnaeus himself described and ignore the miscellaneous and contradictory references, something clear will result.

What it is cannot positively be asserted until the Clifford plant is actually examined for details not brought out in a photograph.

This single and not very complicated case, except that it is upsetting to some of our cherished convictions, well illustrates the difficulties of the exact taxonomist, who must seek the solution of fundamental questions in the ancient collections of the Old World and in the literature of two or three centuries past. The eight citations above noted as essential in getting to the real identity of the Linnean species involved are only a part of them. Hermann and Boerhaave added others and more modern students have made their guesses and have published discussions until, in an attempt to elucidate a single basic fact it is often necessary to have open simultaneously about one no less than 20 or 30 volumes, some of them large folios and several of them rare. In the experimental and anatomical fields this is usually unnecessary. In those fields the books of the past, except as curiosities or as occasional landmarks, are relatively unessential; to the taxonomist who would trace his problems to final solution they are indispensable. The illustration I have given is a very simple one. Many similar ones require the checking and intensive study of twice as many volumes.

This intrinsic difference between the scholarly demands and historic background in taxonomic work (except that which glibly assumes that some one else will settle these troublesome questions) and the needs in the morphological and physiological fields is a serious handicap to many workers. Without the fundamental literature at hand they, obviously, can go only part-way; there they are forced to stop. Furthermore, in too many universities and museums, which really possess a good portion of the necessary literature, workers in taxonomy are perpetually handicapped through the short-sighted policy of administrative officers who, ambitious to make a great show of their library, insist on keeping in centralized stacks many of the books needed by special workers in remote corners of the institution. Too often these special workers, who alone have need of the old books, can secure those which are necessary for their precise work only after an amount of red-tape and delay which becomes deadening. I could tell you of at least one elaborate museum where taxonomic workers, instead of going through the great difficulties necessary

in securing from the distant library the essential books which they need, prefer to write to others hundreds of miles away, to look up, in a library maintained for the workers, points which are salted away but not readily accessible at their own institutions. Unless universities and museums make the essential books readily available to their technical staffs, who alone can use them, they can expect only indifferent results from their workers. In the fields where books are merely consulted and a few notes taken from them, centralization may be advantageous. In a field constantly dependent upon ready and simultaneous access to scores of volumes in settling a single point the essential books should be right at hand.

Another most important prerequisite to final results in taxonomy is access to the types or to accurate photographs of the types. Many thousands of species of the United States and Canada and similar numbers from the West Indies and South America were first described at European establishments. Similarly, thousands of species of the western half of North America were originally described in the Eastern States, as were many from the Pacific Islands and from eastern Asia. In the latter cases the types are readily available; in the former they are often scattered or unknown. On the whole, however, a remarkable proportion of the American plants described by pre-Linnean students, such as Plukenet, Catesby, Morison or Gronovius, are preserved. Several herbaria studied by Linnaeus are extant; these are now stored in vaults underground. The herbarium which partly formed the basis of Thomas Walter's *Flora Caroliniana* (1788) belongs to the British Museum. The tremendous herbarium of André Michaux, the basis of his two-volume *Flora Boreali-Americana* (1803), is kept apart from other collections at Paris. Other fundamental collections by the score are in European herbaria. Properly to interpret the species described it is necessary to know the original specimens. Photographs of many thousands of them have been made; other thousands remain to be photographed; but in many cases photographs alone do not give all that is needed. Minute details of diagnostic importance must be personally examined by the specialist. These studies, unfortunately, must await the new epoch we all are hoping for. Some of us, who have yearned to settle many points by personal

inspection of many types, will never do so, but they will eventually be properly studied and the absorbing and fundamental problems in the proper identification of our species will be settled.

Other historic factors in the proper study of taxonomy could be enumerated, for instance the very important work in tracing the exact routes of early explorers and collectors, such as is being so thoroughly prosecuted by Texan and other southwestern botanists. I must not, however, venture now into that large field, for I should soon tax your patience. The main points I have tried to emphasize are the historic and traditional background of plant taxonomy and plant-names; the dependence of exact taxonomy on the students and specimens of the past; the imperative need, if students in this field are to progress, of their having readily at hand the significant literature, dating back to 1700; and the need of still further studying the original specimens or types, from which our species have been described. This inevitable dependence on the work of the earlier botanists and their specimens is an intrinsic element in plant taxonomy; in the morphological and physiological fields the past and its literature are of relatively slight importance. If I have thus been able to make clear these fundamental differences of stress, I shall have done something to correct a misconception of taxonomy which in recent years has been too much fostered by those unfamiliar with its dependence on the past.

THE STATUS AND DISTRIBUTION OF SOME CYPERACEAE IN NORTH AND SOUTH AMERICA

Hugh O'Neill

Cyperus, Subgenus Mariscus*

The name *Mariscus* in Pliny's Historia Naturalis[1] refers to a species of rush (*Juncus*). In 1742 Haller[2] used the word to describe a genus of plants which embraced a species subsequently called *Schoenus Mariscus* by Linné.[3] Zinn[4] defined the genus in

* [For a monographic treatment of Mariscus refer to Horvat, Sr. M. Liguori, A Revision of the Subgenus Mariscus Found in the United States. Contr. Biol. Lab. Cath. Univ. America. No. 33. 1941.]

[1] 21: 69. A. D. 77.

[2] Enum. Helvetiae 251.

[3] Sp. Pl. ed. 1. 42.

[4] Cat. Pl. Hort. Gott. 79.

1757 as including Haller's *Mariscus* and *Schoenus Mariscus* L. However, a year previously Patrick Browne[5] published a West Indian species (of *Mariscus* Zinn) under the name *Cladium effusum,* thus introducing a new generic name. He failed to characterize this as a genus; however, Crantz[6] described it in 1766. In 1788 the name *Mariscus* was used by Gaertner[7] to designate a group of plants not related to *Cladium* but to *Cyperus.*

Since the *International Rules*[8] validate a genus originally based on a single new species without a separate generic description, the name *Cladium* is recognized by reason of its priority and *Mariscus* Zinn becomes a synonym.

Gaertner's *Mariscus* was further restricted to mean the genus (or subgenus of *Cyperus* as now understood) by Vahl (1806).[9] Since that time it has been treated as either a subgenus or a genus although the latter use is now invalidated since the name had already been used by Zinn for a group synonymous with *Cladium* before Gaertner took up the name. Fernald[10] refers to it as "closely allied to and only unsatisfactorily separated from *Cyperus.*" Robert Brown, Presl, Nees ab Esenbeck, Steudel, Clarke (i. e., in his later views) and Chermezon maintained it as a separate genus. Rottboell, Boeckeler, Bentham and Hooker, Suringar, Pax, Kükenthal and Fernald have preferred to leave it within the limits of *Cyperus.*

The three style-branches (stigmas) and trigonous achenes differentiate the subgenus *Mariscus* from 3 of its allied subgenera, i. e., *Juncellus, Pycreus,* and *Kyllinga,* all of which have two style-branches and lenticular achenes. The fact that the rhachilla does not break up into one-fruited joints distinguishes it from *Torulinium,* which subgenus exhibits that character in a marked degree. The decisive character that separates *Mariscus* from *Eucyperus* has been a much disputed point and still remains to be demonstrated.

Vahl[11] separated *Mariscus* from *Cyperus* only on the basis of its few-flowered ("subtriflorus") spikelets. In this respect he

[5] Nat. Hist. Jamaica 114.
[6] Inst. 362.
[7] De fruct. 1: 12.
[8] Art. 43.
[9] Enum. Pl. 2: 372.
[10] RHODORA. 25: 50. 1923.
[11] *Op. cit.* 372.

was followed by Robert Brown[12] who observed: "Habitus Cyperi, a quo differt solummodo spiculis paucifloris." It might be noted, however, that "paucifloris" meant for him "spicula 2–3-flora." Kunth,[13] among others, pointed out the futility of attempting a separation based on that character: . . . "oft in derselben Art die Zahl der Blüthen variiren kann, so folgt hieraus natürlich, dass die Grenze zwischen jenen Gattungen eben so unbestimmt als willkürlich werden muss." Clarke[14] confirmed Kunth's viewpoint: "The number of fertile flowers to the spikelet is of no use as a diagnostic character: in *Cyperus flavus* there are sometimes five or six nuts to the spikelet, though it is admittedly a typical *Mariscus.*" Lestiboudois[15] also maintained that there can be "spiculae multiflorae" in both *Cyperus* and *Mariscus.*

At one time Kunth tried to make the division between *Mariscus* and *Eucyperus* depend upon the fact that the achene in the former lay in a depression of the rhachilla ("in excavatione rhacheolae receptum"), surrounded by a well-developed and persistent wing. Later, he relegated that feature to the same category as that regarding the number of flowers[16]. "Der von mir früher (in *Nova gen. et species plant.* I. p. 212) der Gattung *Mariscus* beigelegte Karakter, wonach die Früchte in einer Vertiefung der *Rhacheola* liegen sollen, ist zwar vorhanden, findet sich aber gleichzeitig auch in mehreren Abtheilungen der Gattung *Cyperus*, nämlich in denen, welche ich *Papyri*, *glomerati*, *pennati* and *mariscoides* genannt habe."

Nees[17] characterized *Mariscus* by the readily deciduous spikelets which disarticulate from the rhachis above the "squamis inferioribus" (i. e., the secondary prophyllum and bracteole): "Differt a Cypero spiculis a squamis inferioribus articulo solubilibus, rachi residua post lapsum spicularum quasi paleacea remanente."

Clarke[18] accepted Nees's characterization and added an associated glume-character: "The subgenus of *Mariscus* includes

[12] *Prodromus* 218. 1810.
[13] "Uber die natürlichen Pflanzengruppen der Cyperaceen und Hypolytreen." *Physikal. Abh.* 8: 3.
[14] "On the Indian Species of Cyperus." *Journ. Linn. Soc.* 21: 33. 1884.
[15] Essai sur la famille des cyperacées 31. 1819.
[16] *Op. cit.* 4.
[17] "Synopsis generum Cyperacearum." *Linnaea* 9: 286. 1835.
[18] *Op. cit.* 32, 33.

(for me) all those species . . . in which the glumes are permanent; or at all events do not fall from the spikelet before the spikelet has fallen from the rhachis . . . In all the numerous preceding species of *Pycreus*, *Juncellus* and *Eucyperus* the glumes fall from the rhachilla (while the rhachilla remains attached) by a clean-cut line separating the glume from its basal portion, which is decurrent down the rhachilla."

Another diagnostic point of *Mariscus* to which Clarke[19] called attention is the presence of a papilliform disc on which the rhachilla is seated and from which it disarticulates leaving a smooth scar. He would have his meaning of "disc," which he thinks has differentiating value, distinguished from Boeckeler's meaning of the same term: "I hold that two very different things are included as discs by Boeckeler. In many species of *Cyperus* where the spikelet is at all oblique in its axis, in the dried state the rhachilla contracts very near the base *below* the lowest glume: here it seems to sit on a small cushion, but it is very firmly attached, and does not disarticulate at this point. This appearance (often only a result of drying) is not uncommon throughout the genus, as in *C. polystachyus*, where it is often prominent; and I estimate it as of no classificatory importance."

The persistence of glumes on a very readily deciduous rhachilla has been the distingushing factor most widely used to separate the two subgenera. The condition of the papilliform disc has rarely been used. By means of the first character (persistence of glume) certain species are clearly referable to *Mariscus*.

C. retrofractus
C. hystricinus
C. dipsaciformis
C. uniflorus
C. ovularis
C. retrorsus
C. Nashii
C. globulosus
C. flavus
C. regiomontanus
C. Mutisii
C. asper
C. tetragonus
C. Pringlei
C. ligularis
C. thyrsiflorus
C. lentiginosus
C. refractus
C. lancastriensis

The following species, however, show characteristics both of *Mariscus* and *Eucyperus;* indeed, some of them show nearly all the characteristics of *Eucyperus:*

C. Deamii
C. spectabilis
C. Schweinitzii
C. Fendlerianus
C. filiculmis
C. Grayii
C. Martindalei
C. Houghtonii
C. Wrightii
C. Blodgettii
C. Pollardi
C. fuligineus
C. manimae
C. cephalanthus
C. strigosus
C. planifolius
C. Parishii

[19] *Ibid.* 154.

Readily deciduous glumes, disarticulating along a straight line from a more or less persistent rhachilla are conspicuously evident in all the species of the second list, particularly in those of the *Laxiglumi* section of Kükenthal. But almost equally as readily deciduous are the rhachillas, which disarticulate either with none, some or all glumes persistent. The proper classification of these species, therefore, has always puzzled botanists.

Kükenthal[20] considers disarticulation of the spikelet found in typical *Mariscus* an advance over the more primitive type of non-disarticulating spikelet found in true *Eucyperus*. Species formerly regarded as *Eucyperus* by most botanists but showing even in a slight degree disarticulation of the spikelet are considered by him to be undergoing a stage of transition, approaching *Mariscus;* and he has placed them in that category, although they still show many characters of *Eucyperus*.

Apparently, there is not a single reliable character or set of characters available by which these two subgenera can be sharply distinguished from each other. Detailed histological and cytological studies along with genetic and ecological research may in the future yield more satisfactory results. It therefore seems ill-advised to maintain *Mariscus* as a genus when it is a very ill-defined even as a subgenus.

Is Section Aristati properly placed in Mariscus? The Status of Cyperus granitophilus McVaugh

In Castanea **2:** 100–104. 1937, McVaugh described a plant which he considered a new species and which he thought closely related to *C. inflexus* Muhl. (i. e., *C. aristatus* Rottb. in this treatment). The following key shows additional features which may be used to distinguish McVaugh's plant:

Spikelets in dense hemisperic heads; culms rigidly erect; glumes 1.0–2.0 mm. wide, widened at about the middle, 9–13-nerved; achene 0.5–0.8 mm. wide, cuneate-obovoid; stamens commonly 1 or 2 on the same plant; anthers 1.0 mm. long; filaments 2.5 mm. long; rhachilla 0.4–0.8 mm. wide. Apparently confined to soil resulting from the weathering of granite, from Georgia to North Carolina.................. *C. granitophilus* McVaugh.

Spikelets digitate in dense or loose heads; culms more or less flaccid; glumes 0.5–1.0 mm. wide, scarcely widened below the middle, 7–9-(very rarely 5 or 11) nerved; achene 0.3–0.5 mm. wide, oblong to oblong-obovoid; stamens 1 (very rarely 2); anthers 0.3–0.4 mm. long; filaments 1.5 mm. long; rhachilla 0.2–0.6 mm. wide .... *C. aristatus* Rottb.

[20] Engler, Pflanzenr. 4^{20^2}: 35. 1935.

The following are the only specimens of *C. granitophilus* found among 600 sheets of *C. aristatus* (i. e., *C. inflexus*):

Alabama: Randolph County, *McVaugh* 5213. Georgia: Columbia County, *McVaugh* 5144; *Pyron and Duncan* 86; De Kalb County, *Biltmore Herbarium* 5062b (cotype); *Correll* 8380; *Pollard and Maxon* 500; *Small* in 1894, Greene County, *McVaugh* 5326; Hancock County, *McVaugh* 5362; Heard County, *MC-Vaugh* 5181; Oglethorpe County, *McVaugh* 5370; Walton County, *Pyron and McVaugh* 971 (type). North Carolina: Henderson County, *McVaugh* 5410; Forsyth County, *Wherry and Pennell* 14335; Rowan County, *Biltmore Herbarium* 5062a; Franklin County, *H. J. Oosting* 1824. South Carolina: Kershaw County, *McVaugh 5129.*

All these specimens were collected on certain granitic outcrops in the above-mentioned counties although specimens collected on other granitic outcrops were *C. aristatus.* Apparently, the species is confined to primary soils resulting from the decomposition of granite. In fact, angular fragments of quartz and black plates of biotite are intermixed with the roots of the isotype specimen (*Pyron and McVaugh* 971).

According to T. H. Watson (Bull. Geol. Sur. Ga. 9-A, 60–65, 1902 and U. S. Geol. Surv., Granites of the Southeastern Atlantic States **426**: 233. 1910) "the light gray granite of Stone Mountain is strongly contrasted with all other types of granite in Georgia. It differs from them in mineral composition in the large preponderance of muscovite over biotite, which though invariably present, occurs in very small quantity." This difference in mineral composition does not obviously explain why the species seems to be confined to this type of granite. Perhaps the presence of accessory apatite is more significant. All the Georgia granites contain plagioclase in considerable amounts, so that the concurrence of large amounts of calcium and potassium in the resultant soil cannot be used to explain the range of *C. granitophilus.*

The best position for *C. granitophilus*, *C. hamulosus* and *C. aristatus* (including *C. inflexus*) appears to be in *Eucyperus.* In *C. granitophilus* the glumes are decidedly more readily deciduous than the rhachilla; in *C. aristatus* (from North America) the glumes are very nearly as readily deciduous. This is also the case with twenty sheets of *C. aristatus* from the Old World (e. g. *Kotschy* 50, Nubia, in the Gray Herbarium with no rhachillas shed and about fifty glumes gone) and specimens of *C. hamulosus*

(e. g., Herbarium De Candolle 129). This latter species is quite exceptional in the genus in that the glumes are not strictly 2-ranked. This arrangement and the constantly 5-nerved glumes are the only distinctions between it and *C. aristatus*. *C. aristatus*, *C. granitophilus* and *C. hamulosus* all have a solitary stamen (rarely 2), an annual habit, an identical peculiar odor, oblong anthers, and very prominent venation of the glumes. In striking contrast all the *Marisci* in the United States (and nearly all those of the rest of the world) have 3 stamens, are perennials, have no such odor, have linear anthers and glumes with relatively weaker venation. Clearly the *Aristati* do not belong in *Mariscus*. Not only the superficial resemblances of *Aristati* place them, as pointed out by Kükenthal (Engler, Das Pflanzenreich 4^{20^2}: 505. Note 1936) with the section *Amabiles* in *Eucyperus*, but in my opinion also their fundamental characters (Kükenthal takes the opposite view with respect to these last). However, section *Amabiles* (and section *Compressi*), although resembling the *Aristati*, differ from the latter in having the rhachillas very long-persistent and obscurely, if at all, jointed to the rhachis.

Further, the relatively deciduous character of rhachilla and glumes or the persistence and non-persistence of bracteole and prophyllum (often called lower scales) is quite unreliable as a means of determining the relationship of species of *Cyperus*. Equally unreliable as a criterion for the separation of the subgenera *Eucyperus* and *Mariscus* is the method of disjointing glumes and rhachillas, i. e., whether the disarticulation is along a straight or a jagged line. In proof of this the following may be cited:

In *C. compressus* the rhachillas appear to be not at all jointed to the rhachis and only after all the glumes have fallen do they disarticulate along a jagged line above the base. The bracteole and prophyllum are more or less readily deciduous. *C. cuspidatus* behaves similarly.

In *C. erythrorhizos* the rhachillas disarticulate nearly as readily as the glumes leaving a knob persistent on the rhachis exactly as in *Mariscus*. Again, the prophyllum and bracteole behave as in *C. compressus*.

In *C. rotundus* the glumes are very long-persistent; in fact, the auther was unable to find any herbarium sheets where rhachillas, bracteole or glumes had fallen naturally.

C. esculentus has long-awned bracteoles subtending at least the lower spikelets similar to those in *C. flavus*. These as well as the glumes are very long-persistent. Only a few herbarium specimens showed rhachillas deciduous and none at all showed glumes deciduous. Where the rhachillas have fallen the bracteoles are usually persistent and there is usually a disc or knob with a smooth scar exactly similar to that shown in the *Marisci*.

In *C. Iria* the glumes are readily deciduous along a straight line while the rhachillas are long-persistent but finally deciduous leaving a smooth or rough-edged scar above the persistent bracteole and prophyllum.

In *C. pseudovegetus* the glumes are readily deciduous along a straight line; the rhachillas as well as bracteoles are long persistent.

All the foregoing species are universally considered members of *Eucyperus* and yet, their characteristics are frequently those assigned to *Mariscus*. On the other hand, in *C. filiculmis* (placed by Kükenthal in *Mariscus*) the glumes soon disjoint along a straight line; the rhachillas disarticulate with about the same ease and at about the same age as the glumes leaving a smooth disc-like scar but without persistent bracteoles and prophylla. In a specimen of *C. strigosus* (*J. B. S. Norton* 1116, Maryland), the majority of the rhachillas have fallen, but a considerable portion, perhaps 10%, of the rhachillas are still persistent and most of the glumes have fallen from these persistent rhachillas. By contrast, in another specimen of *C. strigosus* (*J. B. S. Norton* 1117, Maryland) about half the spikelets have fallen but no glumes have fallen from any of the spikelets that still persist on the rhachis. Even the fallen spikelets still retain all the glumes! In *John M. Fogg* 3251 from Barnstable Co., Mass. and *True* 2862 from Morris Co., N. J., both *C. strigosus*, most of the rhachillas are persistent while nearly all the glumes have fallen!

C. planifolius L. C. Rich. (= *C. Ottonis* Boeck. = *C. brunneus* Sw.), commonly accepted as one of the *Marisci*, always has rhachillas persisting long after the glumes have fallen!

C. aristatus, *C. granitophilus*, and *C. hamulosus* show glumes that are deciduous before the rhachilla (e. g., *Palmer* 417, from San Pedro Martin Island, Gulf of California, and Torrey's specimen from Yosemite Valley, California, Aug. and Sept. 1872,

both in the herbarium of the Acad. Nat. Sci. Phila., show numerous persistent rhachillas from which the glumes have fallen) but the rhachillas themselves are also readily deciduous (naturally or artificially), leaving a smooth knob persistent on the rhachis, while the bracteoles and prophylla behave as in *C. compressus.*

It seems, therefore, that the weightier and more decisive reasons place *C. aristatus* and its allies in *Eucyperus* as a section but neither in sections *Amabiles* nor *Compressi.*

Status of Cyperus inflexus Muhl.

This species was described by Muhlenberg [Descr. 1817] in terms that do not distinguish it in any particular from *Cyperus aristatus.* He does say "C. squarroso et aristato affinis and C. conferto proximus, Swartz 5." In Muhlenberg's collection at the Philadelphia Academy of Science, folder #44 contains his collection of *Cyperus* (sheets #26 to #49 inclusive). Sheet #27 (collector's #5) is labelled "C. suaveolens compresso prox." without any mention of *C. inflexus* anywhere on the sheet or on the folder. In addition to some ten plants of what has been passing as *C. inflexus* Muhl. there are two dwarf specimens of *C. erythrorhizos* Muhl. Sheet #34 of this same folio (collector's numbers 452 and 474) is *C. erythrorhizos* and was so named by the author. It certainly seems curious that he used his name for *C. erythrorhizos,* but never used *C. inflexus.* This may indicate Muhlenberg himself had misgivings about his *C. inflexus.* The ten plants of *C. aristatus* in Muhlenberg's collection have culms 5–7 cm. tall, spikelets 8–10 mm. long, the body of the glumes 1–1.2 mm. long, almost always 9-nerved. On one mature head 5 or 6 basal glumes are missing on each of the rhachillas which were all still persistent on the rhachis. Many of the pale immature achenes and solitary stamens are persistent on the rhachilla although the glumes have fallen. About 20 to 30 spikelets form a head. The achenes are obovoid-oblong, none of them mature. Although these specimens are a century old, they are still distinctly aromatic. This plant is exactly the same as material collected in Virginia and Pennsylvania today.

This plant has been treated as synonymous with *Cyperus aristatus* Rottb. by Robinson & Fernald [Gray, Man. ed. 7, 175 (1908)] and by Britton [Bull. Torr. Club **13:** 207 (1886)] but by Boeckeler

[Linnaea **35:** 500 (1868)] as a form of *C. aristatus.* Later Britton considered it a distinct species [Ill. Fl. N. E. States **1:** 300, ed. 2 (1913) and Abrams' Ill. Fl. Pacific States **1:** 227 (1933)]. Kükenthal [Pflanzenreich $\mathbf{4}^{20^2}$: 504 (1936)] treated it as a variety of *Cyperus aristatus.* Apparently, Britton nowhere published the means he used to distinguish *C. aristatus* from *C. inflexus,* whereas Kükenthal gives differences which may be summed up in the following table and key:

	Height of plant	No. of rays	Diam. of spikes	Color of glumes	Size of achene
C. aristatus	2–20 cm.	2–5	8–10	"rufae vel ferrugineae vel straminae"	⅓–½ glume
var. *inflexus*	"plerumque humilis"	1–3	4–6	"saepius pallescentes"	½–⅔ glume

Key based on the above Characters

Spikes 8–10 mm. diam. achene ⅓–½ length of glume; glumes brown, red or yellow; plant 2–20 cm. tall; rays 2–5 . . . . . . *C. aristatus* Rottb.
Spikes 4–6 mm. diam. achene ½–⅔ glume; glumes often pale in color; plant very low; rays 1–3 . . . . var. *inflexus* (Muhl.) Kükenth.

With all authors *C. inflexus* is considered to be confined to the American continent. On the other hand, *C. aristatus* is found in the Old World and according to Kükenthal in Yucatan in the New World.

The following table shows measurements, etc. of important features that have been used to differentiate *C. inflexus* from *C. aristatus:*

	Height of culm (cm.)	No. of rays	Diam. of spikes (cm.)	Color of glumes	Length of body of glume (mm.)	Length of mucro (mm.)	Length of entire glume (mm.)
Stewart 9464, Kashmir, N. W. Himalaya	2.5–3.0	0–2	0.5–1.2	straw-colored	1.5	0.5–0.7	2.0–2.2
Koelz 3064, Punjab	1.5–2.0	0–1	0.8–1.0	pale straw-colored	1.5	0.5–1.0	2.0–2.5
Wight 1819, India	3.0–5.0	0–4	0.5	brown	1.0	0.5–1.0	1.5
Delavay 1760, China	2.0–2.5	0–4	0.4–0.8	brown	1.2–1.5	0.5–0.8	2.0

	Height of culm (cm.)	No. of rays	Diam. of spikes (cm.)	Color of glumes	Length of body of glume (mm.)	Length of mucro (mm.)	Length of entire glume (mm.)
Curtis 536, British East Africa	5–10	3–4	0.5–0.9	straw-colored and reddish brown on the same culm	1.0–1.3	0.8–1.0	1.8–2.0
Leprieur, Senegal, Africa, in 1924	6.5–10	3–4	0.6–1.0	reddish-brown	1.0–1.5	0.6–1.0	1.5–2.0
Schlagintweit 6136, Tibet	2.5–5	2–4	0.3–0.4	straw-colored	1.2–1.5	0.5–1.0	2.0–2.5
Schlagintweit 3626 Tsamba, Western Himalaya	3.5–6	5	0.3–0.8	straw-colored	1.5–2.0	0.5–1.0	2.0–3.0
T. Thompson, N. W. Himalaya	1.5–6	3–4	0.7–0.8	straw-colored	1.5–1.8	0.5–1.0	2.5–2.8
J. D. Hooker, East India	0.7–2	3	0.5–0.7	reddish-brown	1.2–1.5	0.5–1.0	1.8–2.0
Kotschy 50, Nubia, Africa	5.0–11	4–6	0.6–1.0	light brown	1.0–1.5	0.8	1.5–2.0
Roper, Senegal, Africa	8.0–13	3	0.5–0.6	brown	1.0–1.2	0.8–1.0	1.5–2.0
**Koelz* 3593, Kashmir, N. W. Himalaya	0.5–1.0	0	Only 1 spikelet at the summit of culm, 2.5–3.0 mm. wide	pale straw-colored	1.5–2.0	0.5–1.0	2.0–3.0
**G. King* 1869, Dehra Dun	1.0–3.5	0	Only 1–2 spikelets at the summit of culm, 1.5 mm. wide	reddish or purplish brown	1.0–1.5	1.0	1.5–2.0
***Lawrence*, India	2.0–5.0	0	0.8–1.2	reddish-brown	2.0–2.5	1.0–2.0	4.0–4.5
***Ward*, India	1.5	0	0.8	reddish-brown	1.2–1.5	1.2–1.5	2.5–3.0
***Wight*, 1820, India (type or isotype)	3–4	0	1–1.5	reddish-brown	1.8–2.0	1.5–2.0	3.2–3.5
***Wallich* 3374, ex herb. Wight (cotype)	3.0	0	0.9	reddish-brown	1.5	1.0–1.5	2.5–3.0
Plantae Exsiccatae Grayanae 130	1–2	0–3	0.7–0.8	reddish-brown	1.4–1.6	1.0–1.2	2.2–2.5
Hapeman, Aug. 3, 1920, Minden, Nebraska	5–10	0–5	0.7–1.3	straw-colored	1.5–1.8	1.0–1.5	2.5–3.0

* *C. aristatus* f. *alpinus* C. B. Clarke
** *C. aristatus* var. *versicolor* (Nees) Kükenth.

	Height of culm (cm.)	No. of rays	Diam. of spikes (cm.)	Color of glumes	Length of body of glume (mm.)	Length of mucro (mm.)	Length of entire glume (mm.)
Gaumer 1023, Yucatan	7–12	0–5	1.0–2.0	dark brown	1.5–2.0	1.0–1.5	2.5–3.0
De Wailly 4686, Africa	4–7.5	0–4	0.5–0.9	straw-colored	1.2–1.3	1.0	2.0–2.2
Rottboell's type specimen (photograph)	5.5–7.5	0–3	0.3–0.5		0.8	0.5–1.0	1.3–1.5

From the above table it is evident that:

(1) The distinction as to height of culm cannot be used to separate Old World from New World material. *Tweedy* 4859, Colorado, has culms 1.5–5.0 cm. tall; *Copeland* 612, California, has culms 0.5–1.0 cm. tall bearing 1 or 2 spikelets. These are very much like C. B. Clarke's forma *alpinus*. Considered by themselves they seem very distinct, but studied in connection with 600 sheets it is readily seen that they are merely depauperate forms connected by a large number of intergrading plants from every part of the United States.

(2) Number of rays is equally useless as a distinction, e. g., *Bartlett* 966, Georgia, has 1–5 rays; *Hapeman*, Nebraska, 1–5 rays, etc.

(3) Although Kükenthal gives spikes 8–10 mm. in diameter for *C. aristatus* and 4–6 mm. for *C. inflexus*, specimens from the southern states, Georgia to California, frequently show spikes 15–30 mm. across, while Old World specimens often have spikes 4–6 mm. in diameter.

(4) As to the color being rufous or ferruginous, this color is about equally common in both Old and New World specimens, and, apparently, is the result of the kind and amount of sunlight which the plant receives. (*Curtis* 536, British East Africa, shows glumes straw-colored and reddish-brown on the same culm.)

(5) As regards the length of glume contrasted with length of achene, the ratio is found to be about the same in both Old and New World material, thus in Old World specimens it varies from 1.9–3.6 and in those from the New World 2.2–3.6. *McVaugh* 4497, Columbiaville, N. Y., has achenes nearly or quite as long as the body of the glume, although some of the achenes are only ⅔ as long as the body of the glume. On the other hand, Sheldon's

specimen from Minnesota, Chapman's from Florida and Hale's from Louisiana show achenes ½ to ⅓ as long as the glume. *J. & T. Howell*, Oregon, Columbia River, shows achenes ⅓ to ⅔ as long as the glumes. *Reverchon* 3591, Texas, has achenes ½ as long. From these specimens selected at random from widely scattered points in the United States as well as from the table, it is quite evident that distinctions based on relative length of achene and length of glume show as wide a variation in American as in Oriental material.

From these facts it seems evident that there is no distinction at all between *C. inflexus* and *C. aristatus* and that it is, apparently, something of a weed in tropical and warm-temperate regions everywhere.

C. versicolor Nees, based on *Wight* 1820, Madras, India, has been reduced by Boeckeler to a variety of *C. aristatus*. This variety is clearly separable by means of the characters listed by Kükenthal (Das Pflanzenreich **4**$^{20^2}$: 504. 1936).

Apparently, Kükenthal very rightly reduced *C. falciculosus* Liebm. to a form of *C. aristatus*. Purpus 6345 seems best treated as this form.

In 1899, F. Cavara published *C. aristatus* var. *Boeckeleri* [Atti Ist. Bot. Univ. Pavia **5**^{2}: 23–28 (1899)] which Kükenthal puts in the synonymy under *C. aristatus* var. *inflexus* [Pflanzenreich **4**$^{20^2}$: 502. (1936)]. The accurately drawn plate showing life-size drawings of four different plants which Cavara comprises within his new variety can all be readily matched by plants from the United States or the Orient. Cavara gives as segregating characters:

> Ochreis purpureo-violaceis, squamis subdecurrentibus, caryopside squamae medium superante, mellea, sub-translucida, stilo exserto, racheola anguloso-contorta.—Omnino gracilior.

Two pages previous to this, Cavara quotes a letter from Boeckeler regarding the variety he had named in his honor:

> . . . Ich habe unsere Pflanze mit einem grossen aus verschiedenen Gegenden und Localitaten stammenden Material des *Cyp. aristatus* vergleichen können, und dabei die ausgezeichnete Beschaffenheit namentlich der Blätter u. Bracteen immer vollig constant gefunden. Gleichvoll kann ich sie nur für eine sehr ausgezeichnete Varietät des Cyperus nehmen.

Curiously, Boeckeler differentiates the variety on leaf and bract

characters, while Cavara refers to other and entirely different ones. Taking the characters proposed by the latter one by one: "ochreis purpureo violaceis" are colors frequently shown on material from any part of the world; "squamis decurrentibus" is hardly accurate, because the glumes are not prolonged and decurrent. Morphologically, the edge of the rhachilla is produced as a cartilaginous margin, not at all continuous with the base of the glume; the other characters he mentions, such as the length and color of the achene, are likewise shown by specimens selected at random from any part of the United States. The rhachillas in this species are all more or less zig-zag. Cavara, further, states that *C. aristatus* is a plant of the tropical regions, saying that it extends to Cuba and Mexico (Orizaba), oblivious to the fact that the same plant found at Orizaba extends as far north as New Brunswick and Vancouver Island. Boeckeler's differentiation is of even less value than Cavara's.

It seems best, therefore, to treat our American material as *C. aristatus* with the following synonymy:

C. ARISTATUS Rottb. Descr. et Icon. 23, t. 6, fig. 1. 1773. *C. uncinatus* R. Br. Prodr. 215. 1810; non Poir. *C. Brownei* R. & S. Syst. 2: 228. 1817. *C. inflexus* Muhl. Descr. 16. 1817. *C. Purshii* R. & S. Syst. 2: 177. 1817. *C. pygmaeus* Nutt. Trans. Am. Phil. Soc. 5: 142. 1837; non Rottb. *C. falciculosus* Liebm. Vidensk. Selsk. Skr. 5^2: 204. 1851. *C. aristatus* forma *inflexus* Boeckl. Linnaea 35: 500. 1868. *C. aristatus* var. *Boeckeleri* Cavara, Atti Ist. Bot. Univ. Pavia 5^2: 26. 1899. *C. aristatus* var. *inflexus* Kükenth. in Engler, Das Pflanzenreich 4^{20^2}: 504. 1936. *C. aristatus* var. *inflexus* f. *falciculosus* Kükenth. in Engler, Das Pflanzenreich 4^{20^2}: 505. 1936. *Chlorocyperus inflexus* Palla in allg. Bot. Zeitschr. 17. Beih. 6. 1911. *Dichostylis aristata* Palla in Engler, Bot. Jahrb. 10: 286. 1888. *Isolepis echinulata* Kunth, Enum. Pl. 2: 205. 1837. *Scirpus intricatus* L. Mant. 2: 182. 1771. *S. lappaceus* Lam. Ill. 1: 139. 1791 (ex descriptione).

In treating *C. aristatus* the following additional variety is to be noted:

C. ARISTATUS Rottb. **Runyoni** O'Neill, var. nov. Achenium lineari-spatulatum, 0.2 mm. latum, apice autem abrupte turgidum quasi-umbonatum 0.3 mm. latum; planta robusta. Caeterum sicut species.

This variety differs from the species in the shape of the achene which is linear-spatulate, 0.2 mm. wide throughout except at the abruptly widened, sub-umbonate apex which is 0.3 mm. wide.

The variety is a very robust plant as can be seen from the following description:

Leaves 1.5–2.0 mm. wide; bracts 1–5 mm. wide; rays 0–3, 0–4 cm. long, the peduncles 0–3 cm. long; spikelets 5–15 mm. long, 1.5 mm. wide, narrowly linear, 15–25-flowered; rhachilla 0.5 mm. wide, 0.2 mm. thick; glumes 2.2–2.8 mm. long, of which the awn is 1.0 mm., the body 1.3–1.8 mm. long, 0.6–0.7 mm. wide, oblong-lanceolate, scarcely, if at all, imbricate; achene 0.8–1.0 mm. long, 0.2 mm. wide throughout except at the abruptly widened, tri-umbonate, apiculate apex which is 0.3 mm. wide, linear-spatulate, grayish-brown (i. e., brown with a frost-like coat), iridescent, substipitate, minutely depressed-puncticulate.

TEXAS: Kenedy Co., *Runyon* #1933 (TYPE); *Runyon* 2655 Los Norias. *Buckley*, Valley of the Rio Grande, in 1879–1883 in New York Botanical Garden, but not Buckley's specimen in the Philadelphia Academy of Science. MEXICO: State of Coahuila, Monclava, *Palmer* 1330. (U. S. Nat'l Herb.). Isotype specimens will be distributed to the Gray Herbarium, U. S. National Museum and forty other institutions.

CYPERUS BUSHII BRITTON

C. Bushii is here considered synonymous with *C. filiculmis*. Britton's type specimen, *Bush* 619 from Arkansas (in the New York Botanical Garden), agrees perfectly in all respects with specimens of typical *C. filiculmis* found in the Eastern States as already pointed out by Fernald & Griscom [RHODORA 37: 153: 1935]. A specimen of Commons collected at Rehoboth, Delaware, August, 1895, is a perfect match of the type. Furthermore, it was found that material from Pennsylvania, Maryland, Virginia and other eastern states could be readily duplicated by the western variants of the species.

A careful examination of other specimens in the New York Botanical Garden which Britton had annotated *C. Bushii* indicates that his idea of that species included the mid-western plant, × *C. mesochorus* Geise (considered in this revision as a form of *C. Schweinitzii* with more densely congested spikes) and many western forms of typical *C. Schweinitzii* (e. g., the plant collected by Capt. Marcy in Oklahoma in 1852 which has rough culms, spikelets all ascending and glumes with conspicuous mucros, 0.3 to 0.5 mm. long).

It may be noted that western forms of *C. filiculmis* and *C. Schweinitzii* intergrade so closely that new names for these

intermediate plants accomplishes nothing except increased difficulty in setting limits to these two species. The following may be cited as examples of intermediate forms: *Rydberg* 2362 from Meadow Park, Colorado, which shows the inflorescence of *C. filiculmis* but the achenes and mucronate glumes of *C. Schweinitzii*, and *Gayle* 622, Ft. Riley, Kansas, which has the glumes of *C. filiculmis* but the inflorescence of *C. Schweinitzii.*

× Cyperus mesochorus Geise and C. Houghtonii var. uberior Kükenthal.

× *C. mesochorus* is treated here as a form of *C. Schweinitzii* with denser heads containing more numerous and more digitately-disposed spikelets in contrast to the more pinnately-arranged spikelets found in typical plants. Although Sister M. Joseph Geise regarded it as a hybrid between *C. Schweinitzii* and *C. Houghtonii*, an examination of several hundred sheets of related species seems to indicate that the plant occupies an intermediate position not so much between *C. Houghtonii* and *C. Schweinitzii* as between *C. filiculmis* and *C. Schweinitzii.*

C. Houghtonii var. *uberior* is evidently identical with × *C. mesochorus.* As representative of his variety Kükenthal cites the following: "Indiana: Dunes (U m b a c h !). Texas: Weatherford (T r a c y n. 7966!)." *Umbach* 1229, Dune Park, Indiana, was the only specimen seen among many collected by that botanist, which could be construed as var. *uberior* and in all probability is the specimen alluded to by Kükenthal. It has been annotated by Sister Mary Joseph Geise as *C. mesochorus.* The specimen is very likely the isotype of Kükenthal's variety and cotype of Geise's hybrid-species. Tracy's specimen matches in all details *Deam* 18168 and others from Indiana which have been annotated by Sister Mary Joseph Geise as × *C. mesochorus.*

Cyperus subambiguus Kükenthal.

Plants intermediate between typical *C. subambiguus* and typical *C. flavus* occur so very commonly, that the two species are considered synonymous in this study. Moreover, several sheets of *Blumer* 1636, from Arizona, isotypes of *C. subambiguus* var. *pallidicolor*, match a specimen of *C. flavus* from Uruguay collected by Arechavaleta as to size and shape of achene, length of

glumes and other characters. The only evident difference is the slightly less dense spikes in the Arizona specimens. *Yuncker* 5632 from Spanish Honduras seems intermediate between West Indian *C. flavus* and the Arizona material. *Ragonese* 184 from Argentine matches the Arizona specimens in every respect.

Cyperus uniflorus T. and H. (= C. subuniflorus Britton)

C. uniflorus and *C. strigosus* are sometimes confused. The following key serves to distinguish these species in the mature state:

Glumes conspicuously clasping the achene, distant, *i. e.*, the apex of one glume barely reaching the base of the glume next above on the same side of the rhachilla, commonly reddish; the nerves aggregated close to the keel, spikelets subquadrangular, 0.7 to 1 mm. wide, 1- to 5-flowered; rhachilla conspicuously curved about each achene, the wings 2 to 2.7 mm. long, 0.5 to 0.7 mm. wide, thickened over the angles of the achene; achene 2.2 to 2.5 mm. long, 0.6 to 1 mm. wide........*C. uniflorus.*
Glumes spreading, imbricate, *i. e.*, the lower overlapping the next above on the same side of the rhachilla about half its length, commonly yellowish or golden brown; the nerves evenly distributed, spikelets compressed or subcompressed, 1 to 1.5 mm. wide, 4- to 20-flowered; rhachilla straight or slightly zigzag, the wings 1.5 to 2 mm. long, 0.3 to 0.5 mm. wide, thin, hyaline; achene 1.5 to 2 mm. (sometimes 2.2 mm. in var. *stenolepis*) long, 0.5 to 0.6 mm. wide..................*C. strigosus.*

C. subuniflorus Britton is here included under *C. uniflorus* since it is impossible to draw any kind of a dividing line between the two entities when a large number of specimens are studied. Both species appear to stand at opposite ends of a long series of intergrading forms. The following specimens picked at random from several hundred sheets are such intermediate forms: *Reverchon* 999, *Hall* 686, *Clemens* 411, *Neally* 214, *Cory* 16517, *Purpus* 8294, *Ruth* 770 and 893, *Runyon* 1924 and 1932. Britton's species, published in *Small's Flora of the Southeastern United States* (ed I. 173. 1903), is based upon *C. uniformis* (obvious lapse for *uniflorus*) var. *pumilus* Britton, previously published as a *nomen nudum* (*Bull. Torr. Club* **13:** 215. 1886). *Palmer* 350 from Indian Territory and *Buckley's* specimen from the valley of the Lower Rio Grande (1879–1883) are respectively the type and cotype of that variety. Since Britton later raised that variety to specific rank as *C. subuniflorus*, these two specimens automatically become type and cotype of that species.

C. subuniflorus has been confused with *C. globulosus*. The differences are shown in the following key:

Achene 0.6 to 1 mm. wide, 2 to 2.5 mm. long; wings of the rhachilla thickened over the angles of the achene; nerves of the glumes aggregated close to the keel; spikelets 1- to 5-flowered; leaves 1 to 2 mm. wide; bracts 3 to 5. . . . . *C. subuniflorus.*
Achene 0.5 to 0.6 mm. wide, 1.3 to 2 (usually 1.5) mm. long; wings of the rhachilla thin, hyaline; nerves of the glumes evenly distributed; spikelets 3- to 12- (rarely 25-) flowered; leaves 3 to 7 mm. wide; bracts 5 to 11. . . . . *C. globulosus.*

Specimens cited by Kükenthal as *C. uniflorus* var. *floribundus* are examples of typical *C. uniflorus* with 1 to 3 extra achenes. The long recurved mucro mentioned as characteristic of this variety is found also on the type specimen of the species itself (*Drummond* 287 in the Torrey Herbarium of the New York Botanical Garden) in just as high a degree of development.

C. retroflexus as shown by the type specimen (*Buckley*, "northern Texas" in the Philadelphia Academy of Natural Sciences) is only a robust form of *C. uniflorus*. On the sheet in Britton's handwriting is "very large form or variety" (i. e., of *C. uniflorus*). Kükenthal reduces the plant to a variety of *C. uniflorus*, but since it has no characters which set it definitely apart from the species it is here placed in synonymy. The monographer mentions "spiculae demum reflexae teretes" as distinguishing feature. The spikelets on all *C. uniflorus* are more or less reflexed. Plank's specimens from Marfa and Burnett, Texas, *Sister M. Clare Metz* 294, *Reverchon* 3426 and Wright's plant from Texas all show reflexed spikelets in varying degrees. They are subquadrangular rather than terete. These same plants also show variable heights of culm, hence that feature must also be ruled out as a means of separating the variety from the species.

Of doubtful status is *C. uniflorus* var. *pseudothyrsiflorus* Kükenth. (= *Mariscus dissitiflorus* C. B. Clarke). Type specimen (*Pringle* 1966 from Nuevo Leon, Mexico) and closely similar Texan specimens, e. g., Buckley's from the Lower Rio Grande, Tharp's from Austin, *Cory* 15582 and 27390, *Hughes* 167 and Wright's, sine loc., all have 3 to 14 achenes in a spikelet. These plants may possibly be hybrids of *C. uniflorus* and *C. setigerus* T. et H.

Cyperus Fendlerianus var. leucolepis (Boeck.) Kükenth.

C. Fendlerianus var. *leucolepis* seems best regarded as synonymous with the species. The distinguishing varietal characters offered by Kükenthal are: "anthela unispicata 14 mm. longa oblonga-conica, spiculae parvae 3–4-florae patentissimae vel deflexae, squamae albescentes obsoletius nervosae purpureo-variegatae." One or more of these characters are not uncommon in typical specimens of *C. Fendlerianus;* plants with only 1 spike often have spikelets bearing 5 to 8 achenes, and plants with 3 or 4 spikes frequently show spikelets with 3 or 4 achenes. The color and nervation of glumes mentioned for the variety are the same as found in some otherwise typical specimens. Color of glumes is a variable, a superficial character not only in this species but throughout the genus. Certainly, it cannot be used to differentiate this variety.

The following table lists the features used by Kükenthal in setting apart his var. *major* from typical *C. Fendlerianus:*

	Culms	Width of leaves	Diameter of Inflorescence	Spikes
C. Fendlerianus	"gracilis"	2–4 mm.	———	"1 cm. longae"
var. *major*	"robustus"	"lata"	"ad 4 cm."	"longiores crassiores"

Only three specimens of *C. Fendlerianus* among the many studied could possibly be considered the variety. Results of a careful examination of these plants particularly in regard to those characters mentioned above are tabulated:

	Culms	Width of leaves	diameter of inflorescence	Spikes
Bros. *Arsène & Benedict* 16195 (cotype)	1.5 mm. throughout	2 to 3 mm.	1.5–2.5 cm.	1 cm. wide, 2 to 3.5 cm. long
Wynd & Mueller 580	1 mm. at apex 2 mm. at base	3 mm.	1.5–3 cm.	"
Shreve 9157	1 mm. at apex	4 mm.	2–4 cm.	"

It is evident that the dimensions are such as to warrant placing the plants either with the species or the variety. The terminal spikes (20 to 35 mm. long) are somewhat longer than they are in typical specimens (10 to 20 mm.), but this character alone does not appear sufficient for maintaining the variety. Accordingly,

var. *major* is regarded in this study as merely a large form of the species.

C. sphaerolepis is placed by Kükenthal in the synonymy of *C. Fendlerianus* var. *debilis* yet the characters given by Boeckeler in his original description, namely, "umbel subtri-radiate; rays 0.6 to 1.8 cm. long; spikelets 2 to 6 mm. long, 4- to 8-flowered," are those of *C. Fendlerianus typicus* and not of var. *debilis*.

C. Rusbyi does not seem sufficiently distinct from *C. Fendlerianus*, since many intermediate plants are commonly found between the two species. In fact, such specimens as Standley's collection from the Organ Mountains, New Mexico (U. S. Nat. Herb. 560818), show what may be taken as the two species in the same tuft. It, therefore, seems best to retain this plant under the varietal name, *C. Fendlerianus* var. *debilis*. Although plants intermediate between the variety and the species itself are occasionally found, it is possible in most cases to separate the two.

Cyperus Plankii Britton

C. Plankii (= *C. ovularis* var. *robustus* Boeckl. and *C. retrorsus* var. *robustus* Kükenth.) is a robust plant of Texas and represents an extreme form of either *C. globulosus* or *C. retrorsus*. From a study of an excellent set of intergrading forms recently collected by *Robert Runyon* of Brownsville, Texas, it seems somewhat more appropriate to place it under *C. globulosus*. The number of florets in the spikelet, the color and texture of the glumes, in fact, the entire spikelet is precisely the same as in *C. globulosus*. The achene fluctuates in width between that of *C. globulosus* and *C. retrorsus*. Although the dense spikes, sometimes elongated, suggest the general appearance of *C. retrorsus*, a better series of connecting forms exists between *C. globulosus* and *C. Plankii* than between the latter and *C. retrorsus*. *Fisher's* specimen from Houston, *Tharp's* from Austin and *Runyon's* specimens 1926B, 2124 and 1926 show this clearly. The last specimen mentioned has 7- to 11-flowered spikelets exactly identical with typical *C. globulosus* spikelets.

C. globulosus and *C. retrorsus* themselves are very similar and intermediate forms between the two occur. The most satisfactory separation seems to be made according to the following key:

Mature spikelets 3- to 8-flowered, commonly yellowish, occasionally purplish brown; achenes commonly 2½ times as long as wide.......................................*C. globulosus.*
Mature spikelets 1- to 3-flowered, purplish brown; achenes 3 times as long as wide.......................................*C. retrorsus.*

It does not seem to mend matters by inserting a third ill-defined group (*C. Plankii*) between two already ill-defined and intergrading species. Accordingly, *C. Plankii* is here placed with *C. globulosus* and considered the form of that species in the xerophytic region of Texas.

C. globulosus var. *pseudofiliculmis* is described by Kükenthal as: "Humilis 3–10 cm. altus. Spicae 1–4 saepe subsessiles agglomeratae vel laterales breviter pedunculatae." A specimen collected by *Ruth* in 1894 in Knoxville, Tennessee, and one collected by *Davis* in South Carolina were the only plants out of approximately 200 sheets of *C. globulosus* which could possibly be considered that variety. Ruth's specimen has mature plants with culms 5 to 8 cm. tall. Both specimens show 2 to 4 spikes but since specimens otherwise typical sometimes have 2 to 4 spikes, that feature cannot be considered diagnostic. Sessile spikes are not distinctive; they occur commonly in many tall specimens. In view of these facts, this variety is not maintained here.

In 1888 Britton published a variety *multiflorus* under *C. echinatus* (Ell.) Wood. In so doing, he transferred Chapman's unpublished variety of the same name from *C. Baldwinii* to *C. echinatus*. Kükenthal and Ekman, evidently, were not aware of Britton's variety, since they published a "new" variety *multiflorus* under *C. globulosus* Aubl. in 1929. Inasmuch as these plants, both Britton's and Kükenthal's, differ in no essential respect from typical *C. globulosus* except that the spikelets have 8 to 12 or rarely even as many as 25 achenes (in the typical material there are 3 to 8), they are included in the synonymy of the species.

Cyperus Nashii Britton

C. Nashii, commonly considered a variety of *C. retrorsus*, seems best regarded as a distinct species on account of the differences shown in the following key:

Achene 3 to 4 times as long as wide, 1.5 mm. long, 0.4 to 0.5 mm. wide; glumes 2 to 2.5 mm. long, 1.2 to 1.5 mm. wide, conspicuously nerved, dull, the margins more or less involute, not meeting at the rhachilla.......................................*C. retrorsus.*

Achene 2 to 3 times as long as wide, 2 mm. long, 0.7 to 1 mm. wide; glumes 2.2 to 3 mm. long, 1.8 to 2 mm. wide, obsoletely nerved, lustrous, the margins tightly involute and frequently meeting or even overlapping at the rhachilla .... *C. Nashii.*

Below are some typical examples of *C. Nashii:*

Type specimens: *Nash* 1196, Eustis, Lake Co., Florida, August 16–25, 1884, in the New York Botanical Garden. Photograph in the Langlois Herbarium. Florida: *Britton* and *Wilson* 28; *Correll* 5846; *Correll* and *McFarlin* 6228; *Chapman*, Apalachicola in 1889; *Cuthbert*, Bradentown; 1613; *Hitchcock*, Eustis; *Nash* 1195, 1196 (type); *O'Neill* 5094, 5095, 7241, 7242, 7244; *Pieters* 45; *Small* and *DeWinkler* 9986; *Small, Small* and *Dewinkler* 10640; *Small* and *West*, Avon Park; *West*, Lake Worth, Palm Beach County; *West* and *Arnold*, Gilchrist County; *Tracy* 6316. Georgia: *Eyles* 6496.

(To be contininned)

NOTES ON SOME FRESH-WATER ALGAE FROM NEW ENGLAND[1]

A. H. Gustafson

Studies on the New England fresh-water algae have extended over a considerable period of time, have been carried on by a large number of well-known algologists both native and foreign, and have been published in an extensive series of papers but our knowledge of even such problems as their occurrence and distribution is fragmentary. The first record of a specific alga together with its place of collection appears to be that of Eaton (6) in 1817. An appendix to Bailey contributed by Cole (3) lists certain species from Salem, Massachusetts and Olney (11) published early Rhode Island records. Since the middle of the last century more than 150 papers containing data on the New England fresh-water species have appeared. A list of the authors of these papers includes a large proportion of the better-known American students as well as a number of representative European scholars. Data on the Maine species has been supplied for the most part by Harvey (7, 8, 9) and West (15, 16) and is far from complete. New Hampshire has been a fertile collecting ground especially for students of the desmids and a considerable

[1] It is a pleasure to acknowledge financial assistance from the Williams College 1900 Fund in carrying on this study.

number of new species have been described from the state but the other algal groups are poorly known. The Vermont records are very scanty. The Reports of the Massachusetts Water Board especially in the decade from 1880–1890 were outstanding in many respects but their contribution to distributional and taxonomic problems left much to be desired. The presence of the Marine Biological Laboratory at Woods Hole, Massachusetts has done much to stimulate a study of the waters of that region. Miss Croasdale's (5) summary of the species known from the Woods Hole area is a valuable contribution to our knowledge of the Massachusetts algal flora but it deals with a limited area and in common with all the studies referred to above made no attempt to treat all the groups now generally regarded as algae. Bennett's (2) Rhode Island list while extensive is certainly not complete. The state-wide survey of Connecticut by Hylander (10) probably makes our knowledge of the Connecticut fresh-water algal flora more complete than that of any of the other New England states but as in the other studies not all algal groups were considered.

Collections made in various parts of New England have revealed the presence of a number of species which will assist in filling in some of the recognizable gaps in our knowledge. These are listed together with some notes on their distribution and occurrence. Several of the species have no doubt been found by previous investigators but no published records exist. Thirty-five species are recorded several of which are rare in the United States. Twenty-five appear to be new finds for New England. Four are first records from Maine; three have been added to the New Hampshire flora; 17 have not previously been recorded from Vermont; and the list known from Massachusetts has been increased by 27.

With the exception of the insertion of the *Cryptophyceae* the systematic treatment follows Smith (12).

MYXOPHYCEAE

Gomphosphaeria lacustris Chodat. No previous report from New England. Found at Laurel Lake, Lee, Massachusetts; Kennebec River, Maine; Lake Ossippee and Lake Mascoma, New Hampshire; White River, Vermont and several Vermont lakes.

HETEROKONTAE

Centritractus belenophorus Lemmerman. There appears to be no published report of its occurrence in the United States although Dr. James Lackey of the United States Public Health Service Laboratory in Cincinnati, Ohio has shown the author many specimens from the tributaries of the Ohio and it has also been found by the author in Michigan (in press). Found in Cole Pond, Williamstown, Massachusetts.

CHRYSOPHYCEAE

Chrysosphaerella longispina Lauterborn. Known only three or four times from widely scattered regions in the United States but not from New England. Found in Sucker Pond, Stamford, Vermont.

Dinobryon bavaricum Imhof. The only New England record is from Connecticut (1). Abundant in the plankton of Lake Raponda, Wilmington, Vermont and sparingly in Lake Sadawga, Whittingham, Vermont, as well as in a bog-pond in Jacksonville, Vermont.

Dinobryon divergens Imhof. Not known from New England. Abundant in the plankton of Laurel Lake, Lee, Massachusetts and Lake Garfield, Monterey, Massachusetts.

Dinobryon sertularia Ehrenberg. This is without question one of the commonest of the New England algae. Found as a very abundant plankton organism all through Maine, New Hampshire, Vermont and western Massachusetts. The only previous records are from Connecticut (4) and Massachusetts (3).

CHLOROPHYCEAE

Volvocales

Chlamydobotrys gracile Korshik. There appears to be no certain published record of this species in the United States although Dr. James Lackey has shown the author many specimens from the tributaries of the Ohio River. Found in the summer of 1940 in the Androscoggin River at Lewiston, Maine in small numbers under interesting conditions. The odor of H_2S emanated from the Androscoggin to such an extent that it could be detected for some distance from the river and, naturally, caused considerable comment and concern in the vicinity. Samples from the surface waters at Lewiston revealed several species of blue-green algae which were not determined specifically. The lone species of green alga sparingly present although apparently in very good condition was the one under discussion. It showed very clearly in a number of slides made from the material. Interestingly enough chemical analyses of the water

made a few days before the samples were studied microscopically showed oxygen to be present only to the extent of half a part per million.

PHACOTUS LENTICULARIS (Ehrenberg) Stein. Found only three or four times in the United States but never from New England. Collected at Bridge's Pond and Cole Pond, Williamstown, Massachusetts as an occasional plankton type.

PLEODORINA CALIFORNICA Shaw. Not known from New England. Found in Cole Pond, Williamstown, Massachusetts and in Woodford Pond, Woodford, Vermont.

ULOTRICHALES

RADIOFILUM CONJUNCTIVUM Schmidle. Smith (12) states this species occurs infrequently in the United States and it has not been listed from New England. Collected several times in Bridge's Pond, Williamstown, Massachusetts and in Lake Raponda, Wilmington, Vermont as well as in roadside ditches in Pownal, Vermont.

CHLOROCOCCALES

GOLENKINIA PAUCISPINA W. and G. S. West. Not known from New England. Collected in the Connecticut River at Turner's Falls, Massachusetts; in Cole Pond, Williamstown, Massachusetts; and in the Connecticut River at Brattleboro, Vermont.

GOLENKINIA RADIATA Chodat. This common planktonic form has not been recorded from New England. Found in several lakes in western Massachusetts as well as in the Housatonic River at Great Barrington, Massachusetts; also, in the White River at White River Junction, Vermont and in Woodford Pond, Woodford, Vermont.

QUADRIGULA CHODATA (Tanner-Fullman) G. M. Smith. New to New England; Leake Pond, Williamstown, Massachusetts.

SCENEDESMUS ACUMINATUS (Lagerheim) Chodat. Known from Connecticut (10); Cole and Warren Ponds, Williamstown, Massachusetts.

TETRAEDRON HASTATUM (Rabenhorst) Hansgirg. New to New England; Cole Pond, Williamstown, Massachusetts.

TREUBARIA TRIAPPENDICULATA Bernard. New to New England; Warren Pond, Williamstown, Massachusetts and the Housatonic River, Great Barrington, Massachusetts.

ZYGNEMATALES

COSMARIUM DENTICULATUM Borge. New to New England; Gokey Pond, Kingston, Massachusetts.

COSMOCLADIUM SAXONICUM DeBary. This species not known from New England is rare in the United States. Found in Lake Onota, Pittsfield, Massachusetts and in a bog-pond in Jacksonville, Vermont.

Euastrum Glaziovi Borgesen. Not known from New England; found in Lake Raponda, Wilmington, Vermont.

Staurastrum arctiscon (Ehrenberg) Lundell var. glabrum W. and G. S. West. Not known from New England; collected at Lake Onota, Pittsfield, Massachusetts, and in Lake Bomoseen, Vermont.

Staurastrum lacustre G. M. Smith. Not known from New England; Lake Raponda, Wilmington, Vermont and Woodford Pond, Woodford, Vermont.

Staurastrum setigerum Cleve. Known from Connecticut (10); Lake Pontoosuc, Pittsfield, Massachusetts.

Triploceras gracile Bailey, var. bidentatum Nordstedt. New to New England; Informe Pond, Hyannis, Massachusetts.

CRYPTOPHYCEAE

Cryptomonas erosa Ehrenberg. The genus has been listed for New England but the species has not been designated. Found at several ponds in Williamstown, Massachusetts.

Cryptomonas ovata Ehrenberg. Unger (14) lists for Maine. Found all through western Massachusetts, in several lakes in southern Vermont and central New Hampshire as well as in the Kennebec River, Maine.

DINOPHYCEAE

Ceratium hirundella (O. F. Müller) Schrank. The genus has been reported frequently from New England but never with the specific designation although as a species frequently dominant in the plankton it must have been collected by almost every student of the algae. Frequent or abundant everywhere in collections from Maine, New Hampshire, Vermont, and Massachusetts.

EUGLENOPHYCEAE

Euglena oxyuris Schmarda. Not reported from New England; Cole and Warren Ponds, Williamstown, Massachusetts.

Euglena spirogyra Ehrenberg. Known from Maine (14), Connecticut (4), and Massachusetts (3); occasional specimen from roadside ditches in Woods Hole and Williamstown, Massachusetts and Pownal, Vermont.

Phacus acuminatus Stokes. Apparently not reported from New England although it is a common species; found at several stations in Massachusetts such as Woods Hole, Worcester, Shelburne Falls, and Williamstown.

Phacus longicauda (Ehrenberg) Dujardin. No New England report since that of Cole (3). Found at Woods Hole and Williamstown, Massachusetts as well as from Pownal, Vermont.

Lepocinclis ovum (Ehrenberg) Lemmerman. The only previous New England record is from Maine (14). Found in the

plankton at Warren Pond, Williamstown, Massachusetts and the Housatonic River, Great Barrington, Massachusetts.

TRACHELOMONAS CREBEA Kellicott. First New England record seems to be from Cole Pond, Williamstown, Massachusetts.

TRACHELOMONAS HORRIDA Palmer. Listed by Unger (14) from Maine; found in Cole Pond, Williamstown, Massachusetts.

TRACHELOMONAS URCEOLATA Stokes. Unger (14) lists the variety SERRATOGLABRA from Maine but the species appears to be new to New England. Found in Warren Pond, Williamstown, Massachusetts.

TRACHELOMONAS VOLVOCINA Ehrenberg. Listed from Connecticut (4) and Maine (14); found in Lake Raponda, Wilmington, Vermont and in roadside ditches Pownal, Vermont, as well as abundantly throughout western Massachusetts.

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WILLIAMS COLLEGE,
Williamstown, Massachusetts.

GRASSES OF HOT SPRINGS NATIONAL PARK, ARKANSAS, AND VICINITY

Francis J. Scully

Hot Springs National Park is particularly rich in the great variety of grasses to be found on its wooded slopes and in its moist valleys and occasional open fields. The following 64 grasses have been collected in the park and the immediate vicinity. A few are evident escapes from cultivation, but it is interesting to note their persistence and spread in competition with native grasses. Determinations have been verified by Dr. Jason R. Swallen of the United States Department of Agriculture. Two species, *Panicum Bicknellii* and *Paspalum laeve*, are reported as being the first specimens received from Arkansas.

Agrostis alba L.
Agrostis hiemalis (Walt.) B. S. P.
Alopecurus carolinianus Walt.
Andropogon scoparius Michx.
Arundinaria tecta (Walt.) Muhl.
Avena sativa L.
Brachyelytrum erectum (Schreb.) Beauv.
Bromus commutatus Schrad.
Bromus japonicus Thunb.
Bromus purgans L.
Cinna arundinacea L.
Cynodon dactylon (L.) Pers.
Dactylis glomerata L.
Danthonia spicata (L.) Beauv.
Digitaria sanguinalis (L.) Scop.
Echinochloa crusgalli (L.) Beauv.
Eleusine indica (L.) Gaertn.
Elymus riparius Wiegand.
Eragrostis cilianensis (All.) Link.
Festuca octoflora Walt.
Festuca Shortii Kunth.
Glyceria striata (Lam.) Hitchc.
Hordeum jubatum L.
Hordeum pusillum Nutt.
Hordeum vulgare L.
Hystrix patula Moench.
Lolium multiflorum Lam.
Lolium perenne L.
Melia mutica Walt.
Miscanthus sinensis Anderss.
Panicum anceps Michx.
Panicum Bicknellii Nash.
Panicum Boscii, var. molle (Vasey) Hitchc.
Panicum commutatum Schult.
Panicum huachacae, var. fasciculatum (Torr.) Hubb.
Panicum linearifolium Scribn.
Panicum microcarpon Ell.
Panicum polyanthes Schult.
Panicum scoparium Lam.
Panicum sphaerocarpon Ell.
Panicum virgatum L.
Panicum Werneri Scribn.
Paspalum dilatatum Poir.
Paspalum floridanum Michx.
Paspalum laeve Michx.
Paspalum longipilum Nash.
Paspalum pubescens Muhl.
Paspalum pubiflorum, var. glabrum Vasey.
Poa pratensis L.
Setaria lutescens (Weigel) Hubbard
Setaria viridis (L.) Beauv.
Sorghum halepense (L.) Pers.
Sorghum vulgare Pers.
Sphenopholis nitida (Spreng.) Scribn.
Sphenopholis obtusata (Michx.) Scribn.
Sporobolus Poiretii (Roem. & Schult.) Hitchc.
Stipa avenacea L.
Triodia flava (L.) Smyth.

Triodia stricta (Nutt.) Benth.
Tripsacum dactyloides L.
Triticum aestivum L.
Uniola latifolia Michx.
Uniola laxa (L.) B. S. P.
Uniola sessiliflora Poir.

Hot Springs, Arkansas

Carex **Bayardi,** nom. nov. *C. crus-corvi*, var. *virginiana* Fernald in Rhodora, xxxix. 393, pl. 476, figs. 1–5 (1937). *C. virginiana* (Fernald) Fernald, ibid. xliii. 542 (1941), not Woods[1] in Rees Cycl. vi. no. 100 (1819).

Again I have been caught by the joker in the International Rules of Botanical Nomenclature. *Carex virginiana* Woods was a substitute for the earlier *C. stricta* Lam., therefore, by the Rules, illegitimate; nevertheless, it has sufficient legitimacy, according to the Rules, to prevent the use of the name again. I am, accordingly, substituting a new name, from Bayard Long, who has helped collect practically all the numbers of this distinguished species.—M. L. Fernald.

Macloviana as a Specific Name.—One of the distinguished members of *Carex* § *Ovales* is *C. macloviana* D'Urville in Mém. Soc. Linn. Paris, iv. 559—reprinted as Flore des Iles Malouines, 28 (1826). *C. macloviana* is one of those vastly significant species which are now known only in scattered areas in the Northern Hemisphere (Greenland; Labrador; Gaspé Peninsula of Quebec; northwestern Canada, with several closely allied forms southward into the mountains of Colorado, Utah and California; Mt. Orizaba, Mexico; and Kamchatka and the Kurile Islands), with the remainder of the species confined to southern South America (Falkland Islands and Tierra del Fuego northward into southern Argentina and Chile). Reaching the Shickshock Mts. of Gaspé the species will find a place in the next edition of Gray's Manual. It has, therefore, become necessary to determine the correct orthography of its name. Some recent students of boreal floras (Ostenfeld in Flora Arctica, etc.; Porsild in his publications on Greenland) render it as *C. Macloviana*, thus suggesting that it is directly based upon a personal name. Others (Kükenthal and

[1] Acc. to *Index Kewensis*, although I find no statement of the authorship in Rees Cyclopedia.

Mackenzie, for instance) follow the original author, D'Urville, in using a lower-case initial.

The species was described from the Falkland Islands, which were early visited by mariners from St. Malo. They, therefore, named the Islands les Iles Malouines; and in D'Urville's paper several species bear the specific name, with lower-case initial, *macloviana*, although the author regularly used capital initials for names directly derived from those of persons, *Epipactis Lessonii* for example. Although the Latin names of St. Malo and its derivative, Iles Malouines, do not appear in the few atlases, gazetteers and Latin dictionaries immediately at hand, the statement in *Encyclopaedia Britannica* is to the point:

> In the 6th century the island on which St. Malo stands was the retreat of Abbot Aaron, who gave asylum in his monastery to Malo (Maclovius or Malovius), a Cambrian priest, who afterwards became bishop of Aleth (now St. Servan).

The specific epithet of *Carex macloviana* is, then, quite parallel with those of the combinations *Scirpus hudsonianus* and *Cerastium beeringianum*, an adjective derived from a geographic name, which originally repeated a personal name. As such it should have a lower-case initial. The wording of the recommendation (no. XLIII) in the International Rules is not wholly satisfactory. It reads:

> XLIII. Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic names (substantives or adjectives).

To these were added in 1935 vernacular names, which are capitalized. The recommendation would better reflect good usage if it said "except those which are derived *directly* from names of persons," for the distinction should be clearly made between names intended to honor persons (*Habenaria Hookeriana*, *Malva Tournefortiana*, etc.) and those based upon geographic areas which were named for persons (*Prunus virginiana*, *Rhexia mariana*, *Claytonia caroliniana*, *Carex macloviana*, etc.).—M. L. Fernald.

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REDISCOVERING SEDUM PULCHELLUM AT ITS NORTHEASTERN LIMIT

JULIAN A. STEYERMARK

AMONG plant collectors in Missouri who made important contributions to the botany of the state during the '60's and '70's Garland C. Broadhead was outstanding. One of the early state geologists, he lived at Pleasant Hill, Cass County, in the western part of the state, and travelled and collected in many other parts of Missouri. On his geological trips he found time to collect plants. He was a keen observer and was one of the first to record the relationship existing between the distribution of plants in Missouri and the geology and soils. He collected many rare plants, a number of which have never since been re-collected either in the state or in the particular county where Broadhead got them. For example, Broadhead found *Cypripedium candidum* in Cass County, but today this species, as far as known, is extinct in that county. Most of Broadhead's herbarium is deposited in the Herbarium of the University of Missouri at Columbia, Missouri.

From the standpoint of phytogeography, Broadhead's collection of *Sedum pulchellum* Michx. from Lincoln County, Missouri, was one of his most notable discoveries. This county is situated in eastern Missouri, lying along the Mississippi River between townships 48 and 51 North (latitude about 39° North). It is the second county north of the Missouri River. Although the

county, generally speaking, is located in the glaciated part of the state north of the Missouri River, many parts of it and adjacent counties have preserved an Ozark topography and flora which give every indication of having escaped Pleistocene glaciation.[1] Throughout its range *Sedum pulchellum* inhabits unglaciated terrain, occurring north of the Coastal Plain from Central Kentucky, Missouri, and southeastern Kansas on the north to northwestern Georgia, Alabama, and Arkansas on the south. Wherry has shown that the previous records for this species from Virginia and West Virginia should be referred to *Sedum Nevii*.[2] In Missouri the collection of *Sedum pulchellum* from Lincoln County by Broadhead marks not only its northeasternmost known point in the state, but the farthest north in its entire range (the Lincoln County locality, slightly north of 39° north latitude, is farther north than its localities in Jackson and Boone counties). Throughout the rest of its dispersal in Missouri, *Sedum pulchellum* is known only from the western half of the state, practically south of the Missouri River. Strictly speaking, it occurs north to Jackson and Moniteau and Boone counties on the north and reaches its eastern limits in Camden, Dallas, Texas, and Oregon counties. Throughout the eastern half of the Ozarks it is absent. This appears strange, since its occurrence in Kentucky, Alabama, and Georgia to the east might presuppose a continuation of its range westward into eastern Missouri. Nevertheless, outside of the Lincoln County record, the species skips eastern Missouri and reappears in the southwestern and west-central part of the state. The nearest stations in Missouri to the isolated northeastern one in Lincoln County are the several known in Boone County, also north of the Missouri River. The Boone County stations are about sixty-five miles (as the crow flies) distant from the Lincoln County locality. But the nearest easternmost Ozark localities (in Camden, Texas, and Oregon counties) are approximately 110, 140, and 170 miles distant (as the crow flies). Thus, this Lincoln County record is a remarkable isolated one when one considers the distribution of the species in the state as a whole.

[1] In a later paper, the author intends to present a detailed account of this "driftless area" of Missouri from the botanical and geological evidence which he has accumulated.

[2] Wherry, E. T. The Ranges of our Eastern Parnassias and Sedums. Bartonia no. 17: 20. 1935.

Since Broadhead's collection of the Lincoln County specimen, almost eighty years ago, some botanists had been skeptical whether he had actually collected the species in this county. By dint of an opportunity to collect in certain parts of Lincoln County during the spring of 1941, the writer chanced to botanize an area known as the "Natural Bridge," located along Sandy Creek, slightly west of the junction of Sandy and Little Sandy Creek, T 51 N, R 2 W, sect. 15, 5 miles west of Whiteside. Here the past meanderings of Sandy Creek have carved out of the Ordovician limestone bluffs a high and beautiful arch, called the "Natural Bridge." Across the valley from this place is another series of high limestone bluffs forming a narrow ridge in sect. 15 and 14 along Sandy Creek. While climbing up the steep ledges of these bluffs along the creek the writer was greatly surprised to encounter several plants of the long-lost *Sedum pulchellum*. As the area became more thoroughly explored many more plants were found. In fact, on the bluffs on either side of the valley, the *Sedum* occurred plentifully on the most exposed parts on top of the bluffs, especially along their edges, as well as along the upper ledges of the bluffs and on rock slides on the slopes. Occurring with the *Sedum* were *Androsace occidentalis*, *Phacelia Purshii*, *Draba cuneifolia* and *Opuntia Rafinesquii*, species which, like *Sedum pulchellum*, are chiefly or entirely Ozarkian in their distribution in Missouri and which are here at or near their northeastern limits of dispersal in the state. Other species with a similar Ozarkian range occurring here at or near their northeastern limits in the state were *Arabis virginica* and *Myosurus minimus*. Remarkable also was the fact that so much of the *Sedum* was actually thriving on parts of the bluffs that were subjected to frequent grazing by sheep and horses. It might have been expected that grazing conditions would have so disturbed this isolated station of *Sedum* as to exterminate it completely during the eighty years since Broadhead's collection of it, most likely from this same station. In fact, when the writer spotted the first few plants on the ledges of rocky bluffs, he noticed that the tips of some of the plants had been chewed by sheep, and he immediately became pessimistic lest these few plants were making the last stand of the species at this locality; but, fortunately, as thousands and thousands of *Sedum pulchellum*

plants were discovered, the writer realized that the flora, judging from the abundance of the other native component species occurring here, had persisted remarkably well despite the introduction of stock-raising. Even if grazing should exterminate it from some parts of the bluffs, another portion of the ridge, which has been fenced off and protected from cattle, would have preserved thousands of plants from destruction. Thus, the little *Sedum pulchellum*, a winter-annual, is still holding its own in Lincoln County against what would appear to be such great odds as to have exterminated many other species of plants. *Sedum pulchellum* is evidently a tough little plant, hard to kill, and it is to be hoped that it will continue indefinitely to reproduce and prosper here, to remind us that it is at its northeastern limit of range.

The writer's collection of this species, deposited in the Herbarium of Field Museum is as follows: at "Natural Bridge" along Sandy Creek and on the other side of the valley on bluffs, T 51 N, R 2 W, sect. 14 and 15, 5 miles west of Whiteside, Lincoln County, Missouri, April 28, 1941, *Steyermark 28532*.

Field Museum of Natural History, Chicago

Carex corrugata from Alabama.—Among the formerly unidentified Carices in the Gray Herbarium there is a sheet from northern Alabama of thoroughly characteristic *C. rugata* Fernald[1] in Rhodora, xliii. 545, t. 671, figs. 1–4 (1941), with the strongly puckered perigynia and the cuneate-obovoid achene with truncate summit as in the plant of the lower Nottaway Valley in southeastern Virginia. The Alabama material is from shaded bottoms of Cotaco Creek, about 12 miles east of Hartsville, Morgan County, May 19, 1934, *R. M. Harper*, no. 3226. This station is in the valley of the Tennessee River. Search farther up that valley, in North Carolina, and farther down, in Tennessee, may further extend the range of the species.—M. L. Fernald.

[1] Carex **corrugata,** nom. nov. *C. rugata* Fernald in Rhodora, xliii. 545, t. 671, figs. 1–4 (1941), not Ohwi in Acta Phytotax. et Geobot. i. 76 (1932).

Another instance showing how difficult it is to find an unused descriptive specific name in a large world-wide genus.

THE STATUS AND DISTRIBUTION OF SOME CYPERACEAE IN NORTH AND SOUTH AMERICA

Hugh O'Neill

(*Continued from page 64*)

Cyperus Pollardi Britton (= C. Deeringianus Britton and Small) and C. Blodgettii Britton

C. Blodgettii and *C. Pollardi* may be regarded as distinct, though very closely-related entities, insofar as the type specimens are concerned. The few differences may be summed up as:

Culms 15 to 30 cm. tall, about 1 mm. thick; rays 1 to 6, 1.5 to 6 mm. long; spikelets congested in ovoid or cylindric heads; glumes 1.5 to 2 mm. long; bracts and leaves rarely septate-nodulose. . . . . *C. Blodgettii.*

Culms 30 to 100 cm. tall, 2 to 3 mm. thick; rays 3 to 7, 3 to 12 cm. long, rarely contracted at the summit of the culm; spikelets densely congested in ovoid or oblong spikes; glumes 2 to 3 mm. long; bracts and leaves frequently septate-nodulose. . . . . *C. Pollardi.*

Unfortunately only 6 additional specimens were found which matched the type of *C. Blodgettii;* all the others examined in this connection were clearly *C. Pollardi.* More material for study might possibly lead to Kükenthal's conclusion, that these 2 species are but one. Due to the paucity of specimens available and to the fact that the type specimens show some differences they are treated here tentatively as distinct species.

The most disconcerting evidence in establishing the status of these species was the fact that Britton determined *Nash* 2309 as *C. Pollardi* Britton. This plant quite evidently matches his type of *C. Blodgettii* from Key West and does not conform at all to his type of *C. Pollardi* from Miami.

It may be noted also that two sheets of *C. Pollardi* (in the New York Botanical Garden) so determined by Britton were redetermined and annotated by Kükenthal as *C. Blodgettii.* Britton's subsequent comment on Kükenthal's annotation label is "Not it". Kükenthal, obviously, did not see Britton's type specimen of *C. Blodgettii;* at least he did not annotate the type.

The type specimen of *C. Deeringianus* (*Small, Mosier and Small* 6789, Arch Creek Prairie, Dade Co., Florida in the New York Botanical Garden) is an immature specimen of *C. Pollardi.* This species (*C. Deeringianus*) was reduced to a variety by Fernald and Griscom (Rhodora **37:** 152. 1935) and referred to

C. retrorsus Chapm. Superficially, this plant and forms of *C. retrorsus* characterized by having long, branched spikes are nearly indistinguishable. A microscopic examination, however, reveals easily recognizable differences; for instance, the glumes in the type specimen of *C. Deeringianus* are conspicuously spreading, cucullate and commonly yellow in color (exactly as they are in *C. Pollardi* Britton) and narrower and longer than *C. retrorsus* plants which have conspicuously appressed more or less clasping but scarcely cucullate and commonly brown glumes. In *C. Deeringianus* the wings of the rhachilla are narrow (0.1 to 0.3 mm. wide) and very readily deciduous (as in *C. Pollardi*) in the forms of *C. retrorsus* they are wide (0.5 to 0.6 mm.) and persistent. *C. Deeringianus* is clearly *C. Pollardi*.

C. retrorsus var. multiflorens Kükenth.

This is based upon Chapman's specimen from Caximbas Bay, Florida. Kükenthal's comment is "nicht gesehen". This specimen is in the New York Botanical Garden and has been correctly determined by Britton as *C. Pollardi*. It is also the type of *C. cylindricus* Chapm. *C. Winkleri* is based on an immature type specimen (*Small and Mosier* 5625) and is identical in every detail with the type and other specimens of *C. Pollardi*.

Mariscus Curtisii (1908) is based upon *Rugel* 387 from Florida as type specimen and *Rugel* 440 and 446 and *Pollard and Collins* 257 as cotypes. This last specimen is also the type of Britton's *C. Pollardi* (1903). All these specimens can, unhesitatingly, be referred to the same species.

The synonymy and distribution of *C. Pollardi* Britton as here understood is:

Cyperus Pollardi Britton ex Small, Fl. S. E. States, ed. 1. 1321. 1903. *C. cylindricus* Chapm. Bot. Gaz. **3:** 18. 1898 non Britton 1879 non *M. cylindricus* Ell. *C. Deeringianus* Britton et Small ex Small Man. S. E. Fl. 151. 1933. *C. Winkleri* Britton et Small l. c. 152. *C. retrorsus* var. *Curtisii* (C. B. Clarke) Kükenthal in Engler, Pflanzenr. **4**[20]**:** 512. 1936. *C. retrorsus* var. *multiflorens* Kükenth. l. c. 513. *Mariscus Curtisii* Clarke, Kew Bull. Add. Ser. 8: 15. 1908. *M. litoreus* Clarke, l. c. 19.— Type specimen: *Pollard and Collins* 257, Miami, Dade County, Florida, April 4–7, 1898, in the New York Botanical Garden. Photograph in the Langlois Herbarium. Florida: *Chapman*, Collier's Key at Marco Pass, Caximbas Bay in 1875 (type of *C.*

cylindricus Chapm. and *C. retrorsus* var. *multiflorens* Kükenth.); *Correll* 6137, 5784, 5933; *Cuthbert*, Bradenton, 1423; *Deam* 2755; *Garber*, St. Augustine, Tampa; *Hitchcock* 383, 384; *Hume*, New Smyrna; *Miller and Reeves* 10; Nash 1268, 1363; *O'Neill* 2590, 5086, 7249, 7250; *Pollard and Collins* 257 (TYPE); *Rugel* 389 and 446 (type and cotype respectively of *Mariscus Curtisii*); *Simpson* 432 (type of *M. litoreus*); *Small and Britton* 9331; *Small*, Caximbas Island; *Small and Carter* 881; *Small and Mosier* 5625 (type of *C. Winkleri*); *Small, Mosier and DeWinkler*, Caximbas Bay; *Small, Mosier and Small* 6685, 6701, 6789 (type of *C. Deeringianus*); *Small, Small and Dewinkler* 10591; *Tracy* 6982; *Underwood* 2234. GEORGIA: *Harper* 928. SOUTH CAROLINA: *Godfrey* and *Tryon* 303, 1180; *Cuthbert*, Sea Island; St. Helena Island. CUBA: *Shafer* 2771 near Porto Barril, Cayo Romano, Camguez, Oct. 26, 1909; *Roig* and *Cumata* 2231, Santa Cristo de Maniadero, July 25, 1920, Cienga de Lapata, Santa Clara, in Bro. Leon's Herbarium.

Below are some typical examples of *C. Blodgettii* Britton:

TYPE SPECIMEN: *Blodgett*, Key West, in the Torrey Herbarium of the New York Botanical Garden. Photograph in the Langlois Herbarium, Catholic University. FLORIDA: *Blodgett*, Key West (type); *Chapman*, southern Florida; *McAtee* 1697; Nash 2309; *Pollard, Collins and Morris* 35; *Small, Britton and DeWinkler* 9371; *Small and Carter* 1178.

CYPERUS STRIGOSUS L. AND VARIETIES.

Large forms of typical *C. strigosus* approach *C. stenolepis* so closely that they cannot be readily separated on the strength of characters usually given; for example, the glumes in both species are equally spreading and involute at maturity; robust forms of *C. strigosus* have leaves just as wide, inflorescences just as much compound and rays just as long as *C. stenolepis*. Such plants as *Harper* 423 and 1552 from Georgia, a specimen collected by *Miss Vail* in Marion, Massachusetts, *Bush* 46 from Missouri, *Larsen* 301 from Delaware and *Dodge* from Port Huron, Michigan (9–17–92) indicate the advisability of considering *C. stenolepis* a variety of *C. strigosus*, as has already been done by Kükenthal [Pflanzenreich **4**$^{20^2}$: 408. 1936] and by Fernald & Griscom [RHODORA **37**: 151. 1935].

The type specimen of *C. Hansenii* is in no respect distinct from robust forms of typical *C. strigosus* and therefore cannot be maintained even as a variety.

Kükenthal describes f. *robustior* as having spikelets as long as 20 mm. Since he limits *C. strigosus* to 10 mm. long, it may be presumed that his concept of the spikelet length is 10 to 20 mm. Fernald gives the length as 20 to 30 mm. Both authors agree on 10 to 25 flowers. When specimens having spikelets 20–30 mm. long are studied they do not show any other distinguishing character except this length of spikelet. *Engelmann's* plant from St. Louis, Missouri, collected in 1845 and *Britton's* from Staten Island in 1879 (both determined by Britton as var. *robustior*) have dense spikes, rather short rays, and only slightly compound inflorescences. *Bush* 6175 from Missouri, another specimen from Oregon Co., Missouri, collected by *Bush* in 1892 and *Hale* 500 from Louisiana have distantly set spikelets and slightly more compound inflorescences. A study of several thousand specimens points out the fact that the length of the spikelet is governed by environmental conditions and is not of any genetic value. Spikelet-length for *C. strigosus* could be arbitrarily set at any other length than those specified and would mean just as much.

Var. *elongatus* and f. *capitatus* differ in only one particular—in that the first has longer rays than the second. It is easy to list a series of specimens grading from one to the other. *Holm's* specimen from D. C., Sept. 1897, is exactly midway between the two plants. It seems best to consider them both as synonymous with *C. strigosus.*

F. *compositus* has been held distinct from the species because of its compound inflorescence. Intergrading forms are abundant. Colonies of *C. strigosus* can readily be found almost anywhere which show that the plant develops a simple inflorescence where it is crowded by other plants, but that the inflorescence is compound where the plants stand in the clear, especially on rich soil, just as trees in dense stands have poorly developed branches while those growing in the open have well-developed branches.

Numerous intermediate forms exist between any two of the varieties which have been placed in the synonymy of *C. strigosus.* This becomes so evident when a large number of sheets are sorted that any attempt to separate these forms seems both impossible and futile.

It is to be noted that in the large collection of *C. strigosus* in the New York Botanical Garden, Britton named only a few

specimens according to the varieties he proposed and in nearly as many cases as not he placed a question mark in lead pencil after the varietal name in his own distinctive hand.

C. B. Clark in 1902 annotated a considerable number of specimens in the New York Botanical Garden but made no mention of any variety.

Chapman's specimen from Florida determined by C. B. Clarke as *Mariscus praelongatus* is *C. odoratus* L. (= *C. ferax* L. C. Rich.). McCarthy 2 from North Carolina was labelled by the collector *C. stenolepis* and determined by Britton as *C. strigosus* var. *compositus*. The specimen really is *C. odoratus* L. Buckley's specimen from the Lower Rio Grande, the type of Britton's var. *gracilis*, is *C. lentiginosus*.

Cyperus Deamii, nom. nov.

C. strigosus var. *multiflorus* Geise, Am. Mid. Nat. **15:** 253. 1934, non *C. multiflorus* Steud. nec Small. Perennis. Radices fibrati, 0.5 mm. crassi, plerumque rubri. Rhizoma perbreve. Culmus 4–20 cm. altus, apice circa 1 mm., basi 1–1.5 mm. crassus, vix tuberascens, compresso-trigonus, rectus, rigidus, multistriatus, levis, haud septato-nodulosus. Folia 1–3, culmo breviora vel longiora 2–17 cm. longa, 2–3.5 mm. lata, acuminata, plana, recta, membranacea, marginibus carinaque parce sigillatimque scabra, haud septato-nodulosus, viridia; vaginae rubropurpureae, in fibras dissolutae. Bracteae saepe 3, anthela breviores vel longiores, 3.5–8 cm. longae, 1.5–3.5 mm. latae. Anthela simplex. Radii 5–11, 0 to 6 cm. longi. Spiculae 10–30 mm. longae, 1 mm. latae, 14–20-florae, subdistichae, subcompressae. Rhachilla 0.1 mm. lata, recta, straminea; alae 1.2–1.5 mm. longae, 0.2–0.4 mm. latae, lineari-lanceolatae, hyalinae sine colore, persistentes. Bracteola 1–1.5 mm. longa, 0.8 mm. lata, lanceolata. Prophyllum secundarium 2 mm. longum, 1.0 mm. latum, lineari-lanceolatum. Glumae 3.2–3.8 mm. longae, 1–1.2 mm. latae, anguste oblongo-lanceolatae, mucronulatae, membranaceae, 5–7-nerviae, arcte imbricatae, sero-deciduae, lateribus stramineae vel rubrae, carina virides, marginibus hyalinae. In flore normali stamina 3 (filamenta 2–2.5 mm. longa; antherae 0.5 mm. longae, 0.2 mm. latae, connectivum haud productum); achaenium trigonum, 1.8 mm. longum, 0.5 mm. latum. In flore abnormali stamina 6 (filamenta 2 mm. longa; antherae planae, steriles, variae nimis, 1–1.2 mm. longae, 0.1 mm. late interdum 0.3–0.5 mm. longae, 0.2 mm. latae, connectivum 1.5 mm. productum); achenium abortivum vel parvulum, 6-costatum; stylus vix 0.5 mm. longus; stigmata 4–6, 1.5 mm. longa.

Perennial. Root fibrous, 0.5 mm. thick, often red. Rhizome very short. Culms 4–20 cm. tall, about 1 mm. thick at the trigonous apex, 1 to 1.5 mm. thick above the slightly tuberous-thickened base, trigonous-compressed, erect, rigid, multistriate, smooth, not septate-nodulose. Leaves 1 to 3 on a culm, shorter or longer than the culm, 2 to 17 cm. long, 2 to 3.5 mm. wide, acuminate, flat, erect, membranous, sparingly antrorsely scabrellate on the margins and dorsal midrib, not septate-nodulose, green; sheaths reddish-purple, becoming fibrous. Bracts commonly 3, shorter or longer than the inflorescence, 3.5 to 8 cm. long, 1.5 to 3.5 mm. wide, in other respects like the leaves. Spikelets 10–30 mm. long, 1 mm. wide, subcompressed, subdistichous, 14- to 20-flowered. Rhachilla 0.1 mm. wide, straight, straw-colored, the wings 1.2–1.5 mm. long, 0.2 to 0.4 mm. wide, linear-lanceolate, colorless, hyaline, persistent. Bracteole 1 to 1.5 mm. long, 0.8 mm. wide, ovate. Secondary prophyllum 2 mm. long, 1.0 mm. wide, ovate. Glumes 3.2 to 3.8 mm. long, 1 to 1.2 mm. wide, narrowly oblong-lanceolate, mucronulate, membranous, 5- or 7-nerved, closely imbricate, tardily deciduous, the sides straw-colored or red, the smooth keel green, the margins hyaline, some of the glumes enclosing 3 stamens (filaments 2 to 2.5 mm. long; anthers normal and well developed, 0.5 mm. long, 0.2 mm. wide, the connective not prolonged) and a trigonous achene 1.8 mm. long, 0.5 mm. wide, other glumes enclosing 6 stamens (filaments about 2 mm. long; anthers flat, sterile, variable in size and shape, 1 to 1.2 mm. long, 0.1 mm. wide, sometimes 0.3 to 0.5 mm. long, 0.2 mm. wide, the connective often prolonged as much as 1.5 mm.) and rarely a 6-ribbed undeveloped achene (style less than 0.5 mm. long, its 4 to 6 branches 1.5 mm. long).—Type specimen: *Deam* 51233, Lake Cicott, Cass Co., Indiana in the herbarium of C. C. Deam. Delaware: *Commons*, Wilmington (Academy of Natural Sciences of Philadelphia). Indiana: *Deam* 51233, Sept. 28, 1931, Cass County; *Deam* 53488, Oct. 7, 1932, St. Joseph Co. New Jersey: *Rusby*, Secaucus, Sept. 15, 1890 (New York Botanical Garden).

This remarkable plant appears to be a very interesting abnormality, but at present it is impossible to determine whether it is a hybrid, a galled specimen, or the effect of a virus disease or of some very exceptional environmental factor. It is the only species of Cyperus out of some 30,000 specimens examined, which had 6 stamens. Commons' specimen from "moist soil", Wilmington, Delaware, suggests an unusual environment in that it has a dwarf specimen of *C. erythrorhizos* (2.5 cm. tall) and two specimens of *Eleocharis obtusa* (3 cm. tall) intimately intertwined

with its roots. If the plant is a hybrid, its appearance would suggest *C. strigosus* × *C. esculentus* or *C. strigosus* × *C. rotundus.*

Cyperus, subgenus Pycreus*

C. lanceolatus Poir.

The distribution of *C. lanceolatus* Poir and its variety *compositus* Presl in the United States is somewhat confused in the existing literature. Chapman [Flora of the Southern United States 1860, 1883, 1897] does not mention this species as such but in the first and second edition of his Flora page 506, *C. rivularis* Kunth is described as having "scales pale straw-color . . . nut . . . black and shining . . . Georgia, Florida and westward." The plant meant here by Chapman is undoubtedly not *C. rivularis* but *C. lanceolatus.* In the third edition, Chapman omits all mention of this plant.

Small [Flora of the Southeastern States 165. 1903 and 1913] mentions this plant under the name *C. helvus* Liebm. which Kükenthal rightly refers to synonymy with *C. lanceolatus* var. *compositus.* But this variety does not occur in the Southeastern States. Later Small [Man. S. E. Fl. 146. 1933] lists this plant as *C. densus* Link which is referred by Kükenthal and the present author to synonymy under *C. lanceolatus.* The distribution of this species in the United States is confined to the vicinity of the Gulf Ports where it is apparently rare and probably introduced. The following specimens have been seen:

Florida: *Mary Stipe,* 121 (Cath. U.), Beacon Beach, west of Apalachicola. August 5, 1939. Louisiana: *Langlois* (Cath. U.), Point a la Hache P. O., Plaquemines County in 1882.

C. lanceolatus var. *compositus* Presl seems to have been found only once in the United States. The record is:

Texas: *V. L. Cory* 24662 (Cath. U.) at Cole Creek, 3 miles east of Field Creek, Llano County, September 20, 1937.

This variety is common in Chihuahua on the other side of the Mexican border.

C. filicinus and C. polystachyos

The pantropical *C. polystachyos* occurs in the West Indies, Mexico, Central and South America. The variety *texensis*

* For a monographic treatment of Pycreus, refer to Corcoran, Sister M. Lucy. A Revision of the Subgenus Pycreus in North and South America. Contr. Biol. Lab. Cath. Univ. America. No. 37. 1941.

(Torr.) Fern. (= var. *leptostachyus* Boeck.) according to Kükenthal extends from Virginia to the West Indies and from Texas to Ecuador and occurs in the Philippines.

The distribution of *C. filicinus* is given by Kükenthal as Maine to the Gulf of Mexico and the West Indies with salt or brackish marshes as the habitat whereas *C. polystachyos* var. *texensis* is assigned to the margins of swamps and the banks of streams.

After a study of several thousand sheets of these three entities the author has come to the conclusion that the following key expresses the only essential differences between these three plants:

1. Spikelets fasciculate, suberect, forming penicillate clusters at the ends of the rays. . . . . *C. polystachyos* var. *typicus*.
   Spikelets divaricate, not densely clustered, not penicillate. . . . . .2.
2. Achenes oblong, 0.4–0.5 mm. wide, 0.8–1.4 mm. long, rounded or truncate at the apex, more than half the length of the glume (sometimes less in maritime plants); glumes 1.0–1.2 mm. wide, 1.5–2.5 mm. long; spikelets 1.5 (rarely 2) mm. wide; culms 0–75 cm. tall. var. *texensis*.
   Achenes obovate-oblong, 0.6–0.7 mm. wide, 1.2–1.4 mm. long, subtruncate at the apex, less than half the length of the glume; glumes 1.0–1.5 mm. wide, 2.0–3.5 mm. long; spikelets 2–3.5 mm. wide; culms 4–45 cm. tall. . . . . *C. filicinus*.

So treated, the distribution of *C. filicinus* Vahl stands out clearly and furnishes fairly good grounds for its specific rank which the author had previously doubted [Rhod. **42:** 85. 1940]. As here understood, *C. filicinus* is confined to salt or more or less brackish situations along the Atlantic Coast from Maine to North Carolina. All citations by this author or other authors from more southerly localities are not *C. filicinus* even though occurring in salt marshes; e. g.

Langlois' specimens from the Gulf Coast have often been cited as *C. filicinus* but the achenes are narrowly oblong and less than 0.5 mm. wide and therefore are *C. polystachyos* var. *texensis.*

Nash 482 (Eustis, Fla.) cited by Kükenthal as *C. filicinus*, has narrowly oblong achenes (0.4 mm. wide) and glumes only 2 mm. long. It is surely var. *texensis.*

Curtiss 3050 (Indian River, Fla.) the type of *C. filicinus* f. *splendens* Kükenthal has the same narrow achenes and glumes only 2 mm. long. It is merely a luxuriant plant of var. *texensis.*

C. Louisianae Steud. is based on a specimen from Louisiana. Although placed in synonymy with *C. filicinus* by Kükenthal it is really a synonym of var. *texensis* as is plain from Steudel's

description, "achenio oblongo subcylindrico." *C. filicinus* does not grow in Louisiana. The plant mistaken for it is simply var. *texensis* with rather long glumes but with narrowly oblong, not oblong-obovate, achenes.

C. Torreyanus Schult. [Syst. Veg. **2.** Mant. 101. 1824] is based upon *C. caespitosus* Torr. non Poir. Torrey, however, had already recognized the fact that he had used a preoccupied name and had renamed *C. caespitosus* as *C. Nuttallii* in 1820. Torrey's type specimen is from New Jersey and is in the New York Botanical Garden. It is undoubtedly *C. filicinus.*

C. Cleaveri Torr. is based on a specimen collected by I. Cleaver in Monmouth County, New Jersey. In the Gray Herbarium there is a half sheet of a dwarfed, attenuate *Cyperus*, labelled *C. Cleaveri*, collected by Cleaver in New Jersey. Photographs will be distributed by the Catholic University. This specimen may be regarded as the type or isotype of *C. Cleaveri* since it fulfills Torrey's description of this species. There are two plants on this half sheet, the one to the right having one and the one to the left having two spikelets. Both are quite clearly depauperate forms of *C. filicinus.* Kükenthal has recognized this plant as a form of *C. filicinus* and it certainly deserves no higher rank. Adams 2497 from Salem County, New Jersey, forms a connecting link between the form Cleaveri and *C. filicinus. C. Cleaveri* is here treated as a synonym of *C. filicinus.*

C. tenuis Muhlenberg. The description of this species is far too vague to be recognizable. In the Muhlenberg Herbarium at the Philadelphia Academy of Science (folio 44, No. 433, sheet 36) are 3 small specimens of *C. filicinus.* They are not labelled *C. tenuis*, nor is there any specimen in Muhlenberg's collection so labelled. Until Muhlenberg's specimen can be found, it seems impossible to determine the status of *C. tenuis.*

C. BIPARTITUS TORR. [Ann. Lyc. N. Y. **3:** 252. 1836.]

This is based on Ingalls' specimen from New Orleans in the New York Botanical Garden. It is merely an attenuate form of *C. rivularis*, not of *C. diandrus* as stated by Kükenthal.

FORMS OF C. RIVULARIS KUNTH.

Regarding f. *elongatus* of Boeckeler, varieties *depauperata, eluta* and *acutata* of Clarke and subvariety *Mohrii* of Farwell,

the author, after examining several thousand sheets of this species, has reached the conclusion that they are mere responses to differences in environment, amount and kind of sunlight, etc.

Cyperus rivularis Kunth var. **lagunetto** (Steud.) O'Neill comb. nov. *C. lagunetto* Steud. Syn. 5. 1855. *C. argentinus* Clarke, Jr. Linn. Soc. **21:** 64. 1884. *C. rivularis* subsp. *lagunetto* Kükenth. in Engler, Pflanzenr. **4**$^{20^2}$**:** 383. 1936. *C. rivularis* subsp. *lagunetto* f. *subacaulis* Kükenth. in Engler Pflanzenr. **4**$^{20^2}$**:** 384. 1936. *Pycreus lagunetto* Clarke, Engler Bot. Jahrb. **30,** Beibl. 68: 8. 1901.—Achaenium late obovatum vel orbiculare; stamina 3 raro 2. Caeterum sicut species.

This plant, treated as a subspecies by Kükenthal, differs in no respect from the species proper as described by him. However, a series of achenes from the United States and Canada compared with a series from South America shows that the variety *lagunetto* has broadly obovate to subrotund achenes while *C. rivularis typicus* has elliptic to obovate-elliptic achenes. In addition, var. *lagunetto* has 3 or 2 stamens whereas *C. rivularis* has only 2 stamens. These appear to be the only distinctions between *C. rivularis* and *lagunetto* and for this reason the latter is here reduced from a subspecies to a variety.

Cyperus niger Ruiz et Pavon var. **capitatus** (Britton) O'Neill, comb. nov. "*C. diandrus* var. *castaneus* Torr." apud S. Wats. Bot. Calif. **2:** 214. 1880. *C. diandrus* var. *capitatus* Britton, Bull. Torr. Bot. Club, **13:** 205. 1886. *C. flavescens* var. *castaneus* subvar. *capitatus* Farwell, Amer. Mid. Nat. **12:** 118. 1930. *C. niger* var. *castaneus* Kükenth. in Engler Pflanzenr. **4**$^{20^2}$**:** 344. 1936.

This variety differs from the species and the other varieties in the castaneous color of the glumes and the conspicuously apiculate achenes almost as long as the glumes.

C. diandrus var. *capitatus* is based on Wright 1949 from New Mexico. This specimen is in the New York Botanical Garden.

S. Watson mistakenly referred Californian specimens to *Cyperus diandrus* var. *castaneus* Torr. which is *Cyperus rivularis* Kunth. Kükenthal on the strength of this misdetermination made a new combination *C. niger* var. *castaneus* (S. Wats.) Kükenthal. But a misdetermination does not set up a new entity. Therefore the first valid varietal name for this plant is *C. diandrus* var. *capitatus* Britton. Wright's specimen is quite

clearly neither *C. diandrus* nor *C. rivularis* but a variety of *C. niger*. Hence the necessity for the new combination.

Extension of range of *C. megapotamicus* Kunth to Panama is shown by *Woodson, Allen and Seibert* 1134 (in Mo. Bot. Garden) Finca Lerida, to Boquete, Chiriqui, Panama, elev. 1300–1700 m. Apparently previously recorded only from Brazil, Paraguay, Uruguay and the Argentine.

Extension of range of *C. polystachyos* var. *texensis* (Torr.) Fern. to the Galapagos Islands, is shown by *Bauer* 311 (Gray Herbarium) Chatham Island, Southwest End, Middle Region, June, 1891 (determined as *C. fugax* Liebm.).

Extension of range of *C. rivularis* var. *lagunetto* (Steud.) O'Neill to the Galapagos Islands is shown by *Bauer* 316 (Gray Herbarium) Chatham Island, Southwest End, Middle Region, June, 1891 (determined as *C. tristachyus* Boeckl.).

Extensions of Range of Other Species of Cyperus and Carex

Cyperus serotinus Rottb. *Fogg* 9574 (Univ. of Pa.), tidal marsh along the Delaware River, north-northeast of Oakwood Beach, Southern New Jersey, August 28, 1935. Apparently the first record of this European species in the United States. Dr. Fogg will make further observations to see if this species is persisting.

Cyperus pilosus Vahl was first collected in the United States by the author in 1936 (his no. 9088) (Cath. U.)[Rhodora **40:** 74. 1938]. It has since been recollected at another locality in the same parish by D. S. and H. B. Correll, their number 10528. "In water of ditch along a road, 3 miles east of Robert, Tangipahoa Parish, La., August 23, 1938". Apparently the species is becoming established in Louisiana.

Cyperus giganteus Vahl. Although not reported from the United States by Kükenthal, this species occurs in Texas [McGivney, *Sister Vincent.* Contr. Biol. Lab. Cath. Univ. 26. 1938]. This range can now be extended to Louisiana by *D. S. and H. B. Correll* 9546 (Cath. U.) "Low, wet, marshy soil on edge of lake, Jungle Gardens, Avery Island, Iberia Parish. (E. A. McIlhenny says that 300 acres grow naturally on the island). 1938".

Cyperus distans L. f. appears to be a recent addition to the flora of Mexico and is substantiated by *Hinton, et al* 9496 (Cath. U.) "Manchón, Mina, Guerrero, 1200 m. Habitat, a barranca. Sept. 11, 1936".

Cyperus prolixus HBK. previously known in the United States only from Louisiana (*Tracy* 397 and 7693), is now known from Texas as shown by *H. B. Parks and V. L. Cory* 11,361 (Texas Agr. Exp. Sta.) "Plant Lice Laboratory, Galveston, Oct. 8, 1934."

Cyperus oxylepis Nees was reported by the author from the United States [Rhodora **40:** 358. 1938]. A second occurrence in Texas is *H. B. Parks and V. L. Cory* 11,520. (Tex. Agr. Exp. Sta.), Matagorda County. The occurrence of this species in Guatemala is substantiated by 4 sheets in the Field Museum: *Standley* 66520, 66567; *Steyermark* 37852, 37860.

Cyperus Swartzii (Dietr.) Boeckl. can now be added to the flora of Mexico. This record is based upon *C. L. and Amelia A. Lundell* 7277 (Cath. U.) "In wet area along roadside, San Luis Potosi, Valles, July 1937".

Cyperus lentiginosus Millsp. et Chase belongs to the flora of the United States. As records there can be cited these collections from Texas: *Buckley*, Lower Rio Grande; *Nealley*, near Corpus Christi, in 1888 and 1889 and at San Diego; *Runyon* 57, 1122; *Rose and Russell* 24211; *Wolff* 4851.

Carex conspecta Mackenzie. *Lyonnet* 2132, 2590 and 2720, all in United States National Herbarium and all from the Desierto de Los Leones, Distrito Federal, Mexico, Oct. 23, 1938, is an extension of range. Mackenzie [N. A. Fl. **18:** 295. 1935] states this species is "known only from the type locality" i. e. Puebla.

Carex Frankii Kunth. *Wynd and Mueller* 550 (Cath. U.) "Sierra del Carmen; Canyon de Sentenela on Hacienda Piedra Blanca; Moist stream side.—Villa Acuña, Coahuila, Mexico. July 6, 1936", is an extension of range. This species apparently has not previously been recorded from Mexico.

Carex geophila Mackenzie. Two new records for this species are: Popocapetl, at an elevation of 11,500 ft. "In tufts on dry slopes" (April 16, 1938) *Edward K. Balls* 4249. La Zimiento, Cofre de perote, Vera Cruz at an elevation of 10,500 ft. May 27,

1938 "Dry earth slopes among rocks", *Edward K. Balls* 4645. Both specimens are in U. S. National Herbarium. Probably the first record of this species from Mexico. According to Mackenzie hitherto known only from the "Mountains of New Mexico and Arizona".

Cladium **californicum** (Watson) O'Neill, comb. nov. *Cladium Mariscus* var. *californicum* Wats. Bot. Cal. **2:** 224. 1880. *Mariscus californicus* (Watson) Fern. Rhodora **25:** 51. 1923.

The ruling of the International Botanical Congress mentioned above (under *Mariscus*) necessitates this new combination. In addition to the stations cited originally by Watson and later by Jepson for California, Fernald cites [Rhodora **25:**51. 1923] specimens from New Mexico and Mexico. To these may be added:

Texas: *Moore and Steyermark* 3679, Culberson County, Guadalupe Mountains; *Standley* 40515, Culberson County; *Palmer* 11014, Barksdale, Edwards County. New Mexico: *Cockerell*, Aug. 28, 1902, Roswell; *Standley* 40463, Black River, Eddy County. Abundant, stems 3–4′ tall. Arizona: *Knowlton* 254, Grand Canyon; *Wooton*, Grand Canyon; *Hitchcock*, Grand Canyon; *Rusby* 852, Grand Canyon; *MacDougal, D. T.* 236, Grand Canyon; *Toumey*, Grand Canyon; *Wooton* 1021, Grand Canyon. California: *Brewer* 105, Los Angeles County.

The range of Fimbristylis miliacea Vahl in the United States is given in the literature as northern Florida. The following additional localities can now be added to this range:

Arkansas: *Demaree* 21636 (Cath. U.), pond margin of Rice Prairie, Gillette, elev. 170 ft. June 21, 1940. Last year, Dr. F. J. Hermann determined *Demaree* 13618, an immature specimen as doubtfully this species. His 21636 is mature and unmistakably *F. miliacea* Vahl. Georgia: *Eyles* 578, Mt. Arabia, DeKalb County; *Eyles* 6504 (Cath. U.) "Edge of gum-cypress bay, Pembroke, Bryan County, August 30, 1939". *Eyles* 6682 (Cath. U.) "9 miles north of Darien, McIntosh County, November 6, 1939". Louisiana: *O'Neill* 8271 (Cath. U.) "In a wet ditch in Pinus Taeda woods, Ponchatoula, August 18, 1936".

Langlois Herbarium,
Catholic University of America.

BIBLIOGRAPHIC NOTE UPON GRAY'S REVISION OF NORTH AMERICAN OXYTROPIS AND SAXIFRAGA

Harold St. John

The collation of bibliographic data is always of value and it is especially so in regard to taxonomic studies where priority of publication is so important. A detailed bibliographic summary of Asa Gray's "Botanical Contributions" was recently published by Joseph Ewan (Am. Midl. Nat. **22:** 218–222. 1939). As he indicated, the dating of these numerous papers is difficult. The dates of the volume may cover several years. The date of communication, usually given near the title and author or in the running heading, is not the date of publication and may be months or years before the time of actual printing. Reprints supplied to the author carried the actual date of publication. From these Ewan has compiled a table of the actual dates of publication exact to the year and to the month and day when originally so stated. All of these were similarly given to the year of publication in the "List of the Writings of Dr. Asa Gray," (Am. Journ. Sci. **36:** Appendix 1–67. 1888) except Ewan's items 7, 11, 14, 20, 21, and 22, which were listed under the date of communication or of the title-page date or of the date established by evidence not now obvious. This early bibliography of Gray's writings was detailed and extensive and accurate for all the "Botanical Contributions" and all others of the numerous publications by Gray known to the compilers, G. L. Goodale, S. Watson, W. G. Farlow, C. S. Sargent, W. F. Ganong, and A. B. Seymour. As a reprint it was distributed with the compliments of Mrs. Asa Gray.

Ewan states (p. 218) that in this early Gray bibliography the enumerations of the "Contributions" was "not in order of issuance as determined by an examination of reprints, but by date of communication to the Academy. For example, the two papers published in the year 1884 and appearing in succession in volume twenty are separated in this list of writings by the interpolation of other titles." It is true that in the Gray bibliography the titles were not arranged by precise date within the year. However, Ewan's critical comments on the arrangement of articles in the earlier bibliography are not completely justified. For

instance, his items 27, 28, 29, 30, 40, and 51 were not arranged by the date of communication in the earlier list.

The writer has a nearly complete set of the reprints of these "Botanical Contributions," being those given by Gray to Howard W. Preston and to Albert Commons. Mr. Commons, of Greenbank, Delaware, made the practice of writing on the cover of each the date of publication or of communication to the secretary, whichever was printed by the title. He also marked the date on which he received the copy.

Ewan obtained data from the assistant librarian of the American Academy of Arts and Sciences, the Gray Herbarium, University of California, Stanford University, and from personal sets of the "Contributions" belonging to M. E. Jones, W. A. Setchell, and W. L. Jepson. For several numbers no date more exact than the year was found.

Evidence can now be added as to the date of Gray's "A Revision of the North American Species of the Genus Oxytropis, DC.; and Notes on Some North American Species of Saxifraga" (Am. Acad. Arts Sci., Proc. **20:** 1–12). Mr. Commons' copy was marked, "Received July 21, 1884." This paper was communicated to the secretary May 14th, 1884. Hence, it can be concluded that the date of publication was between May 14th and July 21st, probably in June or early July, 1884.

University of Hawaii,
Honolulu, Hawaiian Islands

Geranium Bicknellii earlier than G. nemorale.—In a note entitled "*Geranium nemorale*, var. *Bicknellii*," published in Rhodora **43:** 35. 1941, Professor Fernald raised Suksdorf's binomial, *Geranium nemorale*, to valid status on the basis of its publication in Deutsche Botanische Monatsschrift previous to the publication of *G. Bicknellii* in Bull. Torr. Bot. Club, **24:** 92. 1897, Suksdorf's name thought to antedate the latter by five years.

I have been working with the Suksdorf personal herbarium here at Pullman, and I was immediately interested in the change, but, although it would please me very much to find that one of

Suksdorf's many invalid species has been redeemed, I have good reason to believe that there has been a mistake in the matter.

Upon checking Suksdorf's original description from a reprint of D. B. M. in the library, I have found that the correct citation of the magazine is as follows: "Deutsche Botanische Monatsschrift," Band XVI, Heft 12, Dezember, 1898; and not 1892 as was stated in RHODORA.

The error began, I imagine, in what was probably a typographical error in the 1935 paper (RHODORA **37:** 295–301. 1935) in which the description of *G. nemorale* Sksd. was cited as appearing in D. B. M. XVI (222) 1892, instead of 1898. Therefore, in the light of these findings, it would appear that *G. Bicknellii* Britton is still the correct name, and that *G. nemorale* must again be discarded in favor of the former.[1]—WILLIAM A. WEBER, State College, Pullman, Washington.

JUSTICIA **mortuifluminis,** nom. nov. *J. umbratilis* Fernald in RHODORA, xliii. 639, t. 693, figs. 1–3 (1941), not S. Moore in Journ. Bot. li. 216 (1913).—M. L. FERNALD.

[1] Mr. Weber is correct. *Geranium nemorale* was published late in 1898. The description is on one of the last pages of the volume (containing 229 pages).—M. L. F.

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H pl. 636–708, [illegible]

Photograph by Bachrach

Very truly
J. Franklin Collins

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 44. April, 1942. No. 520.

J. FRANKLIN COLLINS

Walter H. Snell

(With Portrait)

Professor James Franklin Collins, taxonomist and forest pathologist, died in Providence (Cranston), Rhode Island on November 14, 1940, after a long illness.

Professor Collins was born December 29, 1863 in North Anson, Maine. He moved to Providence in 1873, where he was educated in the grade and high schools. From 1879 to 1898 he was employed by the nationally known Gorham Manufacturing Company as a silver worker, designer and embosser. In his spare time he became interested in identifying the plants which he came across in his rambles over the State, and it was not long before he sought the assistance of Professor W. Whitman Bailey, head of the Department of Botany at Brown University. Young Collins showed such interest and displayed such skill in this field that Professor Bailey took him under his wing and assisted him in obtaining a technical background for his avocational efforts and opened the University Herbarium to the full play of his talent. In 1894, while still working at his trade at Gorham's, he was rewarded with an appointment as Curator of the Olney Herbarium at Brown University. In 1898, the University awarded him an honorary Ph.B. degree. In 1899, he gave up his work as a silversmith at Gorham's to accept an appointment as instructor in Botany at Brown. He was made an assistant Professor in 1905 and upon Professor Bailey's retire-

ment in 1906 he became head of the Department, in which position he remained until 1911.

In 1907, this versatile man branched out into another field of Botany, which was to develop into the main work of his later life. From that date to 1911, while still teaching at Brown, he became successively Collaborator, Agent and Special Agent in the Office of Forest Pathology of the United States Department of Agriculture, working chiefly upon the chestnut-bark disease. Then in 1913, when the late Dr. Haven Metcalf opened up a branch laboratory of the Office of Forest Pathology at Brown University to deal with the diseases of ornamental trees and shrubs, Collins was made Forest Pathologist and placed in charge. He was subsequently appointed Pathologist and Senior Pathologist-in-Charge. He did not give up his interest in taxonomy at any time during this period, but still spent his spare time collecting plants and building up his own herbarium. He was the unofficial taxonomist for the Office of Forest Pathology and at various times in several pathological investigations was called upon to solve the taxonomic aspects of these problems. He continued to serve as Curator of the Olney Herbarium and was appointed Demonstrator and Lecturer in Botany, in which honorary positions he served until the time of his retirement from the Government service in 1933.

The functions of the Providence Office and Laboratory which Collins administered were in general two:—diagnosis of diseases of shade and ornamental trees and shrubs from specimens submitted by correspondents over the entire United States, and suggestions for control; investigations of such diseases as needed particular attention because of their novelty or imminent or possible danger. The first project came to be a very important one. From the modest number of 8 requests for diagnosis or information in 1913, the number grew to 1,000 in 1932. The more special sorts of projects included the following: chestnut-bark disease; white-pine blister-rust; diseases of camphor, rhododendrons, boxwood, roses and Lawson cypress; needle-blight of white pine; European larch canker; willow scab; *Rehmiellopsis* disease of firs; *Cytospora* and *Sphaeropsis* diseases of conifers.

The technical aspects of the work just mentioned were as-

signed for the most part to members of his staff. A third type of investigation was entirely Collins' own. He early applied his energies and his common sense to the problems of the care and treatment of shade trees and his substantial accomplishments along this line laid the foundations for the scientific care of shade trees and earned him the title of "Father of Tree Surgery". He was responsible for four improvements in the protection of ornamental trees:—1) scientific methods of trimming, etc., instead of the crude tree-butchery too commonly practiced; 2) the open cavity, properly made; 3) a wood-filler for cavities instead of the inelastic cement; 4) a sawdust-asphalt mixture for a more flexible filling. He had the two latter cavity-fillers patented by the United States Department of Agriculture to make the methods available to the public. His Farmers' Bulletin number 1178 on "Tree Surgery" ran through 9 editions and revisions from 1920 to 1934, with a total of 210,000 copies, and Farmers' Bulletin number 1726, "Treatment and Care of Tree Wounds," five editions from 1934 to the present time, totalling 160,000 copies.

Collins was an expert on the higher plants, ferns and mosses. He was moderately well-informed about the fungi. He had an especially intimate knowledge of the natural history of Rhode Island. He knew every corner of the State, every crossroad, path and brook. He collected widely with other members of the New England Botanical Club, more especially in Maine and the Gaspé Peninsula. In the latter region he with his colleagues did a great deal of exploring of hitherto uncharted territory and because of his exploration of one mountain that peak now bears the name of "Mount Collins" and is so accepted by the Canadian Geological Survey. In his later work for the Government, he travelled considerably in this country to study trees and their diseases, the nation's forests and parks.

Collins' publications numbered over 100, with about a score each on the mosses and the chestnut-blight, and the others on ferns, local floras and miscellaneous higher plants. Outside of his "Tree Surgery" Bulletin, his best known work was "Key to New England Trees, Wild and Cultivated", with Howard W. Preston.

Collins was a member of the following organizations:—American Association for the Advancement of Science (Fellow),

American Forestry Association, American Phytopathological Society (Charter Member), Botanical Society of America, Josselyn Botanical Society of Maine (Chairman of Bryophyte Committee for 10 years), National Geographic Society, New England Botanical Club (Committee on Check List, 1901–1911), Rhode Island Botanical Club (one of founders and President several years), Rhode Island Field Naturalists Club (President 3 years, and member of Executive Committee 4 years), Rhode Island Horticultural Society (Botanist 4 years, on Lecture Committee 2 years), Sigma Xi, Brown University Chapter (Treasurer 2 years), Sullivant Moss Society, Torrey Botanical Club. From 1929 to 1936 Collins was an Associate Editor of Rhodora, freely giving his services in the preparation of illustrations.

Collins was a mechanical genius, typically Yankee. He was expert in the use of all kinds of tools and in the utilization of all kinds of materials, but the lack of complicated tools or of special materials was no obstacle to him. With the simplest of facilities, he could make unbelievable things. In the 5 and 10 cent store he could find small items which he could put to a dozen uses, cheap glassware that obviated the purchase of more expensive material from the supply houses. Neither was lack of physical space any hindrance or source of discouragement. He could make an office out of a pillbox and a laboratory out of a closet, by economically using every cubic inch of volume. Folding or sliding tables and benches, shelves on every available bit of wall space and even suspended from the ceiling, sets of drawers and cases ingeniously arranged provided working or storage space where both appeared impossible. A few black curtains pulled down from the ceiling and the proper array of folding benches slipped from their catches would provide a dark-room in the corner near the sink. Collins liked to tinker; if he was ever happier doing anything than collecting and caring for his plants, it was when he had tools in his hands. This propensity and Collins' unfailing good nature were often taken advantage of by his colleagues (including the writer). It was soon found that if he were asked outright to do some little job, he was somewhat reluctant to undertake it and did not know if he had the time. The proper mode of approach was to bring a plan or some ma-

terials or a little job partly done and ask him what was the best way of doing it or how it could be improved. Then Collins would inspect what was essentially the lure, look at it alternately over and through his half-lens glasses, make varied comments and suggestions, and always end by remarking that he was busy at the time, but that if the particular thing were left with him, he would see what he could do with it. Invariably in a brief spell, the job was completely and ingeniously finished.

In addition to being a skilled worker in most of the ordinary types of trades and an expert technician, Collins was an accomplished photographer, an artist in preparing and mounting herbarium specimens, and not unhandy with pen and pencil.

Personally, Collins was a delightful soul. He was quiet, modest, reserved, but very kindly and companionable. He was of even disposition, the kind that "wears well". He knew when to speak and when to listen. He possessed a humor that was twinkling rather than sparkling. He had a remarkable memory for names, places and facts. His sagacious and practical advice was always comforting as well as enlightening. He was abstemious and spartan in his own life, but nevertheless possessed a personal warmth that was often unsuspected. He was endowed with Yankee "horse-sense". He viewed life philosophically, and passed through his long, last illness with patience and courage, calmly awaiting the end which he foresaw ten years ago.

There passed a MAN, one of unquestioned ability, attainments and culture, who chose to avoid the swirl of complicated modern existence and to live as a quiet botanist.

Brown University.
Providence, Rhode Island.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXL

INCIDENTS OF FIELD-WORK WITH J. FRANKLIN COLLINS

M. L. Fernald

(Plates 696–707)

Fifty years ago, in late July and early August of 1892, I made my first field-trip with Frank Collins or, as he always signed himself, J. Franklin Collins[1]. He then invited me to join him and a group of his cousins and friends at the old Collins home in North Anson, Maine, whence we started for several days of camping, trouting and botanizing, making two chief sojourns, one on the shores of the Kennebec at Carratunk, the other above The Forks, in Carrying Place Plantation, at the mouth of Dead River. The very names, long seen on maps, Carrying Place and Old Military Road, survivals from the time of Arnold's futile and costly expedition up the Kennebec, thence via the Dead River to Quebec in the American Revolution, thrilled my boyish imagination. My earlier botanizing had always been within walking-distance of home and, having a keen interest in plants which I had been forced to follow alone, it was a wonderful new experience to be with an older and kindly companion to whom I dared speak in the peculiar language which I had previously been able to share with few others. While the various cousins and friends enjoyed the out-of-doors activities of a camp in the woods, Collins and I made the acquaintance of many plants which I had never seen near Orono, and I quickly recognized that I was with a friend of unusual sincerity, modesty and skill. Quiet, undemonstrative, of few words, sensitively sympathetic, always with a quiet, dry humor, a master of woodcraft, mechanical technique and specimen-making, he gave me the companionship and help I had yearned for; and for 32 years it was a very exceptional summer which did not find us exploring or camping and botanizing somewhere in New England or the Gaspé Peninsula, our last trip together being with the party which went to the Mt. Logan region of Gaspé in 1923.

[1] James Franklin Collins, b. North Anson, Maine, December 29, 1863; d. Providence, Rhode Island, November 14, 1940. For biographical appreciation see Walter H. Snell in Rhodora, xliv. 93–97 (1942).

Our first considerable expedition was in August, 1896, when, accompanied by the late Professor William C. Strong of Bates College and my young brother, the late George Bancroft Fernald, we hired the old-fashioned stage-coach of the North Anson-New Portland route, as a commodious vehicle for camp-equipment, presses, paper and foodstuffs, and drove across to Dead River Plantation, there to get at Mt. Bigelow, then on to Flagstaff and back under the western slope of Bigelow. That trip gave us our first sight in Maine of *Prenanthes Boottii* and some other montane species previously known in the state only on Katahdin, and it strongly cemented a friendship.

Collins was a conscientious keeper of records. Several of his diaries, always literally kept up by an entry, no matter how adverse the conditions, at the end of each day, were designated by him shortly before his death to come to me, along with his invaluable volumes of photographs taken on our many trips together. These have been supplemented by many botanical notes received either by me or by the Gray Herbarium from his sister, Mrs. Edith Jenckes. The diaries are explicit and they followed an almost unvarying pattern. There are no frills; all sentiment and emotion are omitted. The simple framework is there, upon which, as he afterward reviewed them in his late years of enforced inactivity, he greatly enjoyed mentally filling in the abundant unrecorded but vividly remembered details. With characteristic caution he refrained from setting down off-hand identifications of plants seen or collected each day; until they had been studied that would have been unwise. I am, therefore, in the following notes, using Collins's framework and, whenever they might be of interest to other botanists, supplying some of the identifications he withheld. The first few excerpts are quite typical of the whole series, beginning with the Mt. Bigelow trip of 1896 and closing with the Mt. Logan expedition of 1923.

"August 13, 1896, . . . Fair and not quite so warm. Slept well last night and got up about 5.00 A. M. . . . The Fernalds went collecting along the river and a little later Professor Strong followed them. I stayed about camp and fixed it up. Had pickerel, fried sweet potatoes, oatmeal, cocoa, etc. for breakfast . . . About 5 P. M. a very heavy shower accompanied by much wind passed over. We all had to take hold of the tent to

prevent its blowing away—three of us outside and one inside. It came up so suddenly that we had no time to pick up a pile of driers, and the last we saw of them they were sailing through the air one or two hundred feet above the ground in the direction of Dead River. We did not bother to chase them up. Rain fell most of the evening. All of us were very wet below our rubber coats, and the tent was badly ripped in two or three places." Characteristically, there is no statement that only through his personal skill and forethought in meeting the emergency did we have any shelter through the remainder of the trip, for it was he who had brought first aid for an injured tent.

Still briefer the following, ten years later, while ascending Rivière Ste. Anne des Monts in Gaspé, on the way to Mt. Albert.

"August 6, 1905, Sunday. Cloudy and hazy. Spent all day on the river, going from Marten River Camp to Main Camp, a short distance below the Forks. Hard poling". (Plate 701, fig. 1).

"August 7, 1905, Monday. Rain last night and most of the day. Toasted driers before fire and fixed up camp to protect against rain. Coté caught some trout [the large sea-trout, running up the river] and shot two ducks. Breakfast of potatoes, coffee, etc. Dinner of trout, duck, tomatoes, etc."

A little more detailed the entry for

"August 8, 1905, Tuesday. Clearing somewhat last evening and cooler. Broke camp about 9:00 A. M. and got ready to go up the mountain. Left camp near the Forks of the Ste. Anne River about 9:40 A. M. Fernald and I carried small packs, camera and collecting boxes. We went up over a near-by ridge and then down through a ravine, then up the mountain, stopping every ten minutes for a rest. Coté, the two Gagnon boys, and Joe Fortin carried heavy packs. We reached an altitude of 3250 feet about 1:30 P. M. and decided to camp there. Coté, Fernald and I stayed up the mountain; the rest of the men went down to the river-camp. About 3 P. M. Fernald and I went higher up the mountain, botanizing, and left Coté to fix camp. He came up the mountain later". The remarkable discoveries on this trip will be later considered.

In the summer of 1900 Collins was a member of the Mt. Katahdin Expedition, described in some detail in Rhodora for

June, 1901 (iii. no. 30). The other members of the party, besides Collins and me, were much older and, consequently, somewhat less active amateurs, the late Judge Joseph R. Churchill,[1] Dr. George Golding Kennedy[2] and Emile Francis Williams.[3] It naturally fell to the lot of Collins and me to work together over the more precipitous and less accessible areas. Returning to camp we put up the better material, throwing the remnants outside the cabin. This refuse-pile accounts for some of the labels of Emile Williams, now preserved in the Gray Herbarium or in the herbarium of the New England Botanical Club: "Collected by J. F. Collins and M. L. Fernald, recollected by E. F. W." Judge Churchill, who prided himself on never putting into his personal herbarium any specimen which he had not himself collected, could not be induced to share our *Saxifraga stellaris*, var. *comosa*, *Epilobium alpinum* L. (*E. anagallidifolium* Lam.) and other specialties. He looked longingly at the abundant material we brought in but it never went into his herbarium.[4]

As a result of the Katahdin trip Kennedy and Collins recorded 23 bryophytes new to Maine, one of them the first known except in Eurasia; and 18 vascular plants were recorded as new to the

[1] See C. H. Knowlton in RHODORA, xxxvi. 1–7, with portraits (1934).

[2] See Emile F. Williams in RHODORA, xxi. 25–35, with portrait (1919).

[3] See B. L. Robinson in RHODORA, xxxiii. 1–18, with portrait (1931).

[4] Only once in my experiences in the field with Judge Churchill did he partly yield to temptation. Then, when he, Williams, Collins and I were in the gorge of the Aroostook River, he sought without success for any *Woodsia alpina* within his reach. Finally, in despair, he consented to lean over and allow me to stand on his shoulders (supported by the cliff) to get some of the plants which, collected with his aid, he felt justified in preserving! Another incident indicating the uncompromising loyalty to principle of Judge Churchill may be noted. When he was asked to join the Katahdin party, to be gone beyond the reach of the outside world, he had grave doubts. Through many years of married life he had never been away from Mrs. Churchill; she had always accompanied him on his trips. Finally Mrs. Churchill persuaded him to go with us, since he could write her a daily letter. This he consented to do, often to the extent of a long evening by candle-light or by staying in camp while we were away botanizing. The Judge specially paid one of the guides daily to take his letters fifteen miles toward the railroad to a "depot-camp," whence they might be picked up and delivered at a post-office. When, finally breaking camp and starting home, we reached the "depot-camp", there were all twenty fat letters on the window-sill. The Judge delivered them in person. Still another non-botanical incident of this trip, which was not recorded in the "Katahdin number" of RHODORA, concerned Dr. Kennedy. Always a Scotchman, he feared that the guides might forget to stock up with oatmeal. He, therefore, went to S. S. Pierce in Boston and ordered a five-pound box sent in care of the head-guide. When, after reaching Camp Kennedy, by Chimney Pond on Mt. Katahdin, Dr. Kennedy hopefully unwrapped the box from S. S. Pierce, he found five pounds of confectionary with a gentleman's card. Imagine the feelings of the lady with five pounds of uncooked oatmeal and a memorandum in a strange man's writing!

state, one of them, *Carex katahdinensis*,[1] new to science and subsequently found only twice, once in east-central Newfoundland, once on Lake St. John at the head of the Saguenay in Quebec.

In subsequent years Collins and I were much in Aroostook County, Maine; and in the summer of 1904 we had our first trip together to the Gaspé Peninsula. I had been on the Grande Rivière in southeastern Gaspé with the late George H. Richards and the late Lewis Cabot, who was then owner of the seigneurie, lured there by the discovery by Mr. Richards of a new *Comandra, C. Richardsiana*, and a wonderful series of *Anemone, A. multifida*, forma *polysepala* and var. *Richardsiana* and *A. riparia*, forma *rhodantha*, and other plants I had never encountered. The brief trip there in late June had yielded my first *Cystopteris montana* (Lam.) Bernh.; *Carex concinna, Sisyrinchium montanum, Osmorhiza obtusa* and *Valeriana septentrionalis* Rydb., all of the Rocky Mountains; and three undescribed species, *Antennaria appendiculata, Arnica chionopappa* and *Taraxacum Longii*, the two latter subsequently found in western Newfoundland. Such discoveries, made in limited spots (when and where there was good salmon-fishing) whetted my appetite and, hurrying back to a meeting of the Josselyn Botanical Society at Fort Kent, in northern Maine, I looked forward with restlessness to returning with Collins to the region. From the train, on the trip to northern Maine, I was thrilled by the precipitous headlands and cliffs which suddenly came into view, centering on Bic in Rimouski County, Quebec; the return to Grande Rivière was, consequently, delayed.

Collins's diary for the summer of 1904 records a very diversified season of discovery.

"July 6, 1904, Wednesday (Bangor—Fort Kent, Maine). Breakfast at 6 A. M. at the Bangor House. Went to Fort Kent on the 7:10 A. M. train, arriving there at 3:40 P. M. On the train were some twenty people going to the meeting of the Josselyn Botanical Society, including the Misses Hunter [now Mrs. Clarence H. Knowlton], Louise H. Coburn, Mary Clark, Sarah Brooks, Elsie L. Shaw, Nellie F. Mansfield, Dora H. Moulton and some I did not know, and the Messrs. W. L. Powers, Clarence

[1] The authors of species in Gray's Manual are omitted. When species and varieties not in the manual are mentioned their authors are noted, except those published by the writer; these may be assumed.

H. Knowlton, W. F. Stubbs, Dana W. Fellows, Ora W. Knight and a few more." . . . .

"July 7, 1904, Thursday (Fort Kent). Clear; got up at 5 A. M. and worked on mosses and helped Fernald [with his large collection from Grande Rivière, spreading and picking up driers and otherwise making himself unselfishly helpful, whereupon he was nicknamed by the ladies 'the faithful Collins']. After breakfast a party of twenty-three or -four started on a trip to St. Francis. We rode up the south side of the river, stopping occasionally to botanize." Along the St. John a *Viola*, then new to science, *V. novae-angliae*, was flowering and Miss Shaw made one of her wonderfully accurate water-color drawings of it, now in the Gray Herbarium.

"July 8, 1904, Friday. Clear. . . . In the P. M. Fernald, Dr. [George Upham] Hay, the Misses Brooks and Shaw and I walked down the bank of the St. John River botanizing", among many striking species getting the newly discovered and thus far quite endemic *Carex Josselynii* (Fern.) Mackenz., just as, a few years earlier, almost the same party, with the addition of the already venerable John Macoun, had collected at Fort Fairfield the equally local (endemic) *C. elachycarpa.*

"July 11, 1904, Monday. Cloudy, rainy in the P. M. Had breakfast at 6 A. M. at Dicky House. About 7:30 A. M. Miss Brooks, Miss Shaw, Dr. Hay, Fernald and I crossed over to Clairs, New Brunswick, and went on the 8:30 Temiscouata train to Rivière-du-Loup. The scenery is very fine, the railroad following down the St. John to Edmundston, then up the Madawaska to beautiful Lake Temiscouata [by the English-speaking people called 'Tommysquatty']. Had dinner at Notre Dame du Lac. [Collins omitted to state that the ride was so jerky and heaving that everyone was miserable or worse, so much so that, as we slowed down on approaching Notre Dame du Lac, a sufferer, looking out at the signs, caused a refreshing ripple of laughter as he disconsolately said 'Notre damn de luck']. Reached Fraserville (Rivière-du-Loup station) about 4:30 P. M. and went to Hotel Bellevue at R.-du-L. Point". The next days were spent in botanizing on the always fascinating shores of the St. Lawrence from the Point to Cacouna, always with the wonderful view across the broad river (there about 13 miles wide) of the

Laurentides. Miss Shaw, working until dark and again from dawn to breakfast-time, was kept over-busy drawing the many plants new to her, *Zigadenus glaucus* Nutt., *Cornus suecica, Pedicularis palustris* and many others—her paintings now a prized possession of the Gray Herbarium; while Collins and I were discovering the then undescribed *Puccinellia lucida* Fern. & Weath. and other choice species.

"July 15, 1904. Friday. Fair. . . . At 12:30 P. M. Fernald and I rode to the Intercolonial Railway station and came to Bic (Ste. Cécile du Bic). Walked to the Canada Hotel (proprietor Michel Pineau) and got rooms." Our days at Bic were very full; there seemed to be no limit to the novelties. *Woodsia oregana* at our first eastern station; *Cystopteris fragilis*, var. *laurentiana* Weath., then a novelty; *Ruppia maritima*, var. *intermedia* (Thed.) Aschers. & Graebn., at the first North American station east of the Pacific states; *Puccinellia laurentiana* Fern. & Weath., then an undescribed species; *Calamagrostis purpurascens* R. Br., at the first station known in eastern North America; *Cerastium beeringianum* Cham. & Schlecht., a characteristic and very distinct species of northwestern America; *Draba minganensis* (Victorin) Fern., then an undescribed species; *Arabis Holboellii* Hornem., typical (Plate 696, fig. 1), at our first station in the East; *A. Holboellii*, var. *Collinsii* (Fern.) Rollins (Plate 696, fig. 2), then quite new but subsequently found in the Rockies; *Saxifraga cespitosa* L., a "typus polymorphus" of the Arctic; *Potentilla nivea*, also arctic; the new × *Geum pulchrum* a strikingly handsome hybrid of *G. macrophyllum* and *G. rivale; Antennaria subviscosa*, representative of localized species of Greenland, Newfoundland, the Rocky Mountains and Patagonia; and numerous others quite new to us and very thrilling. Recent burns, too, were brilliant with masses of the strawberry-like fruits of *Chenopodium capitatum*, the drooping large white and yellow petunia-like corollas of *Leucophysalis grandiflora* (Hook.) Rydb. (Plate 699, fig. 1), or with *Corydalis aurea, Dracocephalum parviflorum* or the western *Senecio indecorus* Greene; while ferns, such as *Woodsia alpina* and *Dryopteris fragrans*, var. *remotiuscula* Komarov (Plate 697, fig. 1), and orchids, such as the Cordilleran *Goodyera decipiens* (Hook.) F. T. Hubbard, were so very abundant that we almost tired of them. To us

FIG. 1 (upper): ARABIS HOLBOELLII.
FIG. 2 (lower): ARABIS HOLBOELLII, var. COLLINSII.

FIG. 1 (upper): DRYOPTERIS FRAGRANS, var. REMOTIUSCULA.
FIG. 2 (lower): POLYSTICHUM MOHRIOIDES, var. SCOPULINUM.

New Englanders this was a new world (a bit of Cordilleran America transplanted into the East); and the botanical fascination of the region, added to the scenic rarity which has so long attracted colonies of artists there, made it difficult to leave. We could not forget, however, that we were really on the way to Gaspé and that we had an appointment to meet Arthur Stanley Pease at Carleton on the Baie des Chaleurs.

"July 24, 1904, Sunday. Warm. Had breakfast at 7 A. M. and at 8:15 A. M. started for Tracadigash Mountain. . . . We ascended to a point about one half mile west of the main peak and thence along slowly [because stopping to collect *Collomia linearis* Nutt. of western North America; *Carex praticola* Rydb., at its second station in eastern North America; the always fascinating *C. Backii; Clematis verticillaris* in solid tangles; and *Poa Canbyi* (Scribn.) Piper, at its first (but not the last) known eastern station] to the summit, which is surmounted by a large wooden cross. . . . The aneroid showed 1930 feet above sea-level. Pease and Fernald worked along the base of the cliff, finding several interesting plants [*Polystichum Lonchitis, Hackelia americana* (Gray) Fern., at its first known station in the East, etc.]. I worked along the top of the cliff, going down occasionally on the alpine rope to collect."

As I have said, Collins was reticent and undemonstrative; incidentally, in a French-speaking country he was inclined to let others do the talking. It was, consequently, a complete surprise, at breakfast one morning at Carleton, to hear his bilingual pun. He suffered from dyspepsia and regularly had his cup of hot water at the beginning of breakfast. His conventional greeting to the waitress every morning included "de l'eau chaude, s'il vous plait." On the morning I refer to the porridge had been eaten, then there arrived the fish and toast and my cup of coffee, with glasses of milk for Collins and Pease. Without cracking a smile Collins quietly remarked: "There seems to be a great deal of de lait about de l'eau. In Providence it is often the other way 'round". One expected such things from Pease, but never from Collins!

For this day the diary proceeds: "Worked until 10:30 A. M. on plants and then Fernald, Pease and I started for the cedar-swamp on the road to Tracadigash Mountain. After we had

botanized there an hour or more a heavy thunderstorm passed over. I happened to have an oil-coat with me but Fernald and Pease did not have any; so they removed their clothes and put them in their waterproof rücksacks during the half-hour shower. They said the big drops felt like hail-stones and they were numb with cold, but after the shower they had dry clothes to put on."

After Carleton came the Little Cascapedia River, one of the most fascinating of Gaspé streams, with gravel-flats carpeted with miles of the trailing shrub, with great plume-like heads of fruit, *Dryas Drummondii* Richardson of the Canadian Northwest; with thickets bordered by *Astragalus frigidus* (Richardson) Gray, var. *gaspensis* (Rousseau) Fernald, closely related to a Cordilleran variety, or with the Cordilleran *Lonicera involucrata*. On the gravels we also got the Rocky Mountain *Sisyrinchium montanum* and the then new *Solidago graminifolia*, var. *septentrionalis*. The calcareous cliffs crowded closely down to the small river, and we were delighted to get characteristic *Parnassia Kotzebuei* Cham.[1] (Plate 698, fig. 1), another northwestern plant, and other species quite new to us.

Compared with the Little Cascapedia, the Bonaventure, which we next ascended, is a large river, with extensive tidal marshes at its mouth. Here we got the very distinct *Juncus balticus*, var. *stenocarpus* Buchenau & Fernald, a new variety, not yet known away from the Gulf of St. Lawrence; *Stellaria crassifolia*, a species which in the East is concentrated about the Gulf; and the new halophytic *Bidens hyperborea* Greene, var. *gaspensis*. Up-river, slightly below the carpets of *Dryas Drummondii*, there were great areas of *Epilobium latifolium* L., Plate 698, fig. 2, a depressed arctic-alpine perennial with thick, gray foliage, and flowers two or three times the size of those of *E. angustifolium*. In springy spots *Carex media* R. Br. (*C. angarae* Steud.) of Asia and northwestern America was new to the East; the then undescribed *C. Garberi*, var. *bifaria* (Gaspé

[1] *Parnassia Kotzbuei* was wholly new to me. When I reached Cambridge with our collections the late Dr. Rydberg was visiting the Gray Herbarium. I showed him the *Parnassia* and he promptly replied: "That's a new species. I have just finished the genus for the North American Flora. Why can't you and I publish this new one there?" I forthwith studied the genus and found that our plant was the well known Alaskan species of Chamisso. In this study, however, I found a very distinct novelty, collected in Montana by Rydberg. This, the only species I share with him, was published as *P. montanensis* Fern. & Rydb. in the North American Flora, the only time I was ever invited to contribute to that variegated work.

Fig. 1 (upper): Parnassia Kotzebuei.
Fig. 2 (lower): Epilobium latifolium.

FIG. 1 (upper): LEUCOPHYSALIS GRANDIFLORA.
FIG. 2 (lower): SALIX VESTITA.

to northern Maine; southern Alberta and British Columbia), and the new *C. flava*, var. *gaspensis*, were abundant, while dripping ledges were yellow with *Saxifraga aizoides*, with *Anemone parviflora* frequent. On calcareous slopes *Dryopteris Robertiana* (Hoffm.) C. Chr. abounded. Our very brief visit to the Bonaventure gave good evidence that detailed exploration would yield fine results.

Travel on the Baie des Chaleurs by steamer is a special art. Witness the record.

"August 10, 1904, Wednesday. Clear. Had breakfast at Bonaventure about 7:30 A. M. At about 8 A. M. or a little later our baggage was carried up the beach a short distance and left at a store for transportation to the steamer 'Admiral' when she or he came. When the 'Admiral' appeared in the distance the tide was so low that the regular lumber-boat which carried passengers and baggage out to the steamer could not be floated; so two whale-boats were hauled by horsepower out to deep water, luggage was hauled out to one, and the passengers, some eight in number, were hauled to the other. Both boats were then rowed out to the path of the 'Admiral'. . . . At Newport, l'Anse au Gascon, and Grand Pabos lumber-boats came out to meet the steamer—at the last place there was a heavy sea and the transfer of freight and passengers was exciting . . . arrived at Grande Rivière at 7:00 P. M."

We landed at Grande Rivière because it was important to get up-river in late summer to explore in more detail the shores which, in June, had yielded so many novelties. The owner, Mr. Cabot in Boston, had given me authority to employ one of his officials, since it would now be close time on salmon-fishing and the man would be at our command. Unfortunately, Mr. Cabot, then far from Grand River, did not realize what we soon discovered; his faithful employe was up-river in the employ of various county officials enjoying forbidden fruits! Repeated calls at the official residence proved futile and our only botanizing on the river was near its mouth. There, however, we got the then undescribed and very local and endemic *Salix paraleuca*. Lingering for a few days, always hopeful that we might yet ascend the river, we utilized the time to some advantage. Near our temporary home there was a marl-bog, full of such charac-

teristic plants, already familiar to us, as *Carex chordorrhiza, C. livida*, var. *Grayana* (Dewey) Fernald, *Juncus stygius*, var. *americanus* and *Orchis rotundifolia;* but the Rocky Mountain *Salix myrtillifolia* Anders. was a novelty, as were *Drosera linearis* and *D. anglica*, the beautiful little red-flowered *Rubus acaulis* Michx. and its relative, the then undescribed *R. peracaulis* Bailey (of northwestern America). At another boggy spot, the margin of Marl Pond, we discovered the then quite new little *Galium brevipes* Fern. & Wieg., a species subsequently found by Dr. Porsild in Greenland; and the limy pockets yielded the type-collection of *Drosera rotundifolia*, var. *comosa*, plants with the flowers altered to clusters of leaves, these dropping off and rooting. The exposed bluffs along the outer Bay had a dense tangle of *Aster*. From this assemblage we extracted the original collections of *A. foliaceus* Lindl., vars. *crenifolius* and *subpetiolatus*, plants endemic on the Gaspé Peninsula. Finally, realizing that our canoeman had no intention to come for us, we moved on. Later, at Gaspé Basin, we met some of the poachers who took evident delight in having thwarted us Yankees.

"August 16, 1904, Tuesday. Mostly clear. In the early A. M. we worked on the plants and then packed trunks. Started from Grande Rivière about 9:30 A. M., our baggage on one wagon, and Rupert driving the other with us. About noon we stopped at Cape Cove for dinner. Later we started for Percé where we arrived about 4:00 P. M. We tried four different places before we found a single room, at Mme. Traché's." [This room, heavily musked and liberally hung with Mme. Traché's clothes and the inevitable sacred pictures and ornaments, with one feather-bed, screened by very thick curtains, the window tightly nailed against possible opening, was the home and workshop for three men. At night we matched pennies to decide which of us would have the good luck to sleep on the floor, which would accommodate only one.] "After supper [of parboiled beans] and unpacking a bit we walked up on one of the headlands [Cap Barré] near the house, doing some botanizing": *Cerastium beeringianum*, var. *grandiflorum* (Fenzl) Hultén of Alaska and northeastern Asia; *Draba incana* L. and its var. *confusa* (Ehrh.) Poir., the first from so far south; the new *D. pycnosperma* Fern. & Knowlton, a beautiful little species endemic on outer Gaspé and in western

Newfoundland, the plant Emile Williams, when he collected it a year later, suggested as the appropriate emblem, on account of its name, for the Society for the Protection of Native Plants; the arctic *Saxifraga oppositifolia* and *Arenaria rubella* (Wahlenb.) Sm.; and the types of the nearly endemic *Solidago lepida* DC., var. *molina* and of *Senecio pauperculus* Michx., var. *firmifolius* Greenm. That was a brilliant start and we tried to overlook the deficiencies of hotel-accommodations, complete lack of modern sanitary and toilet facilities, and improper food. These could not be wholly ignored, however, for we all suffered from pretty acute indigestion and, when we had had parboiled beans for three successive days and I asked our hostess for something more digestible, we came in to a supper of heavy French pancakes. Mme. Traché's father, a fisherman who spoke English, sat at table with us, and noticing that our physiological adjustments were not like his own, encouraged us by frequently urging: "Eat hearty, fellers. Men can't work the way you do without eating hearty." Our own supply of educator-crackers, raisins and chocolate kept us going and when, after getting back to Cambridge to recuperate, I was promptly sent to the Stillman Infirmary to have my inflamed appendix out, I was thankful that the operation had not been done by the fishermen at Percé!

"August 17, 1904, Wednesday. Foggy and rainy all day. After breakfast we worked a while on the presses, then put on our waterproof clothes and botanized on the crags northwest of the house and about the waterfall in the ravine (La Coulée) until noon. After dinner . . . collected along shore to and around the lighthouse at White Cape. Here Fernald had the alpine rope looped around his shoulders and walked along the treacherous and crumbling edge of the cliff while Pease and I held the other end of the rope some distance away from the cliff. Got home at 6:30 very wet." The day had been so foggy and rainy that many flowers were beautifully expanded, others as conspicuously closed. We specialized upon *Euphrasia*, bringing back *E. arctica* Lange, *E. rigidula* Jordan, *E. tatarica* Fisch. and *E. americana* Wettst., and some not easily settled. Small boys followed us wherever we went, always anxious to help the "doctors" gather their herbs. They were specially fond of bringing us bulbs of *Zigadenus glaucus*, with the explanation that

"it's a horrible thing for the guts"; in view of the toxic properties of the genus, reflected in its western name "Death-Camass", we did not try it.

"August 18, 1904, Thursday. Fair a little while in the A. M. during which we partially dried driers, etc.; later alternately rainy and fair . . . at 12:30 P. M. we all went up Mt. Ste. Anne to the shrine, botanizing both going up and coming down. Used the rope considerably about the summit [collecting the type-material of *Antennaria gaspensis* and many other fine species]. Took some pictures (Plate 700, fig. 1) from the summit when the clouds and rain would permit." The last modest statement was tyical of Collins's almost puritanic dread of expressing emotion. He was keenly appreciative of the unique beauty and grandeur of the Percé landscape, verbally became very enthusiastic, and throughout this and all other trips with me spent as much time on photography as on botany. His negatives from Gaspé ran into the thousands. The tops of the balsam firs, *Abies balsamea*, here presented a strong contrast with firs as we knew them generally. Upon material from Mt. Ste. Anne I based my var. *phanerolepis*. An incident on the trail well illustrated the mental subservience of these people. Looking out to the northeast, we saw a long and low land, obviously Anticosti. When we met the priest with a workman, who was repairing the trail to the shrine, by way of conversation we pointed to the distant island and asked, "Is that Anticosti?" The workman promptly replied, "Oui, oui, Anticosti", but his master said, "No, you can't see Anticosti from here", whereupon the man corrected himself: "Non, non, ce n'est pas Anticosti."

The diary continues until our reaching Boston on September 2nd. From Douglastown we went a very short distance up the Douglastown and from Gaspé Basin an equally short distance up the Dartmouth River. We could get no canoes and had to be content with heavy lumbermen's bateaux, solid and very slow. Our discoveries were, therefore, relatively unimportant.

In the summer of 1905, Emile and Mrs. (Blanche) Williams and Mrs. Williams's friend, Miss Mary Waring, joined us for a trip over the same route, through Williams's July vacation, and Mr. and Mrs. Oakes Ames were with us for a brief trip up the Grand Cascapedia. Since the specialties have been so thoroughly

FIG. 1 (upper): PERCÉ FROM SLOPE OF MT. STE. ANNE (Rocher Percé near middle; Bonaventure Island in distance, at right).
FIG. 2 (lower): GANNETS NESTING ON LEDGES OF BONAVENTURE ISLAND.

FIG. 1 (upper): HARD POLING.
FIG. 2 (lower): COLLINS (center) ENJOYING LIFE.

covered in the notes for 1904 only a few items for July need here be noted.

Botanically the Grand Cascapedia is relatively uninteresting. The plants which make the Little Cascapedia a joy are largely wanting. At Percé we had superior quarters at the fine old house of M. Le Boutillier, the elderly head of large fisheries and of large stores. One of Collins's entries records a notable new station near Percé.

"July 25, 1905, Tuesday. Cloudy, foggy and rainy. We all spent the A. M. in taking care of plants collected yesterday. In the early P. M. we went by team to Grande Coupe. Mr. and Mrs. Williams botanized along the bases of ridges and Miss Waring, Fernald and I went up the cliffs and around to the next 'coupe' to the westward. We got some nice things, *e. g. Dryas integrifolia* Vahl, *Salix vestita* Pursh (PLATE 699, FIG 2) *Polystichum Lonchitis, Corallorrhiza striata,* etc. [including the arctic-alpine *Carex rupestris* All., the new *Salix Bebbiana,* var. *capreifolia* and the tiny *Thalictrum alpinum* L.]. Got back about 7:00 P. M. very wet. Had a fine supper."

That "very wet" day on the dripping ice-cold cliffs of Grande Coupe laid Collins and me off with intestinal disturbances and hard colds, which did not soon vanish. Consequently, after the Williams party had sailed for home, we took the steamer "Gaspésien" from Gaspé Basin to Mont Louis on the north coast of the Peninsula, picking that village out as likely to have proper food and as being the center of precipitous limy walls, which fascinated us. Collins's brief entry only partly tells the story.

"July 31, 1905, Monday. Clear. Got up on str. 'Gaspésien' at about 4:30 and went on deck. Stopped there most of the A. M. enjoying the scenery [and taking many photographs]. Reached Mont Louis and went to the bargeman's house [one Bouchier, a piratical giant with ragged black beard and great projecting tusks, who, when we asked for the hotel, replied, 'I have the hotel', not divulging the spick-and-span house, with fine food, run by Fred Au Clair, which, of course, we knew nothing about. Dinner consisted of bread and butter, tea and chunks of salt pork, floating in grease, not the best food for our condition; our room was a bit of unfinished loft, without window, and reached by a ladder from the kitchen and living-room. We were not

enthusiastic to remain there]. In the P. M. and again in the evening we walked out and examined the cliffs, etc., for plants. Did not seem to find a single characteristic plant and we were much disappointed. [Showing how completely mental and physical discouragement control the outlook. In 1923, when, under better conditions, a party botanized about Mont Louis, and in 1931, when, with Mr. and Mrs. Charles A. Weatherby and my daughter and son, I spent some days there, it was difficult to break away from the fascinating cliffs and slopes, which support such treasures as *Carex misandroides*, endemic representative here and in western Newfoundland of the rare Canadian Rocky Mountain *C. Franklinii* Boott; *Draba lanceolata* Royle, of Asia and western North America; the endemic *Astragalus scrupulicola* Fern. & Weath., eastern representative of the western *A. aboriginum* Richardson; and *Oxytropis gaspensis* Fern. & Kelsey, endemic eastern representative of the Rocky Mountain *O. viscida* Nutt.; *Erigeron compositus* Pursh, var. *trifidus* (Hook.) Gray, at its first known station south of the Arctic and east of the Rockies, and scores of non-endemic specialties. On July 31, 1905, Collins and I were glad to think Mont Louis a poor spot.] Talked of driving to Ste. Anne des Monts but no one would undertake to haul our trunks there over the rough and hilly roads. Later decided to go in a barge [lobster-boat with decayed fish smearing the whole inside]."

"August 1, 1905. Tuesday. Cloudy, windy and cold . . . Started about 8 A. M. in a barge with M. Bouchier and another man [fare 'dix piastres'] for Ste. Anne des Monts. We were practically becalmed for an hour near Pt. de Chasse. Reached Ste. Anne des Monts about 4:30 P. M. nearly frozen. Went into LeMontagne's store and talked with him about boarding places, eating, etc. He recommended Ed. Lefrancois' place." Supper consisted of "bifstek", carrots, baked potatoes, lettuce, graham bread, a choice of 23 kinds of relish and condiments, massed at the center of the table, pickled beets, cake and cherries! We immediately forgot that we were desperately ill and when, after supper, Lefrancois asked "Are you going in to Mt. Albert?" we woke up, "just like that" and said, "Why, this is where you start for Mt. Albert, isn't it?" In half an hour the famous guide and hunter, Sam Coté, was with us, planning the trip, to start as soon as possible. That shows what proper food will do!

"August 3, 1905, Thursday. Cloudy and foggy in the A. M. Clearing in the P. M. Clear with aurora borealis in the evening. In the A. M. spent most of the time in getting ready to go up river. Had Lefrancois haul our baggage down to the river after dinner and about 1:30 P. M. we started up-river, with Fernald and part of the luggage in one canoe, I and the rest of the baggage in another. The river is a rather rough one and we went up about one hundred feet in the first nine miles. Here we stopped for the night at Col. Starkey's lower camp. Our canoemen (Coté, Joe Fortin and Hector and Edouard Gagnon) pitched tent and Fernald and I dined with Col. Starkey (owner of the salmon-fishing rights on the river). Nice dinner and pleasant chat afterward. Fernald and I in tent; the canoemen in the guides' house at the camp. From here we got our first fine view of the foothills of the Shickshock Range."

"August 4, 1905, Friday. Fair, partly clear; very warm in middle of day. We left 'Nine-mile Camp' about 8 A. M. and stopped for lunch at 11:05 A. M. While we were lunching, two men came down the river with the skin of a bear they had killed at the next Starkey camp. We camped near the head of a long and hard rapid known as 'Three-mile Rapid'; and then passed through a wild and beautiful rocky gorge (Grand Rapid), where it was very difficult to get the canoes through. Fernald and I in our lean-to tent under canopies; canoemen in another tent".

"August 5, 1905, Saturday. Cloudy and somewhat showery. Warm in middle of the day. Collected a considerable number of specimens [*Festuca prolifera* (Piper) Fern.; the new *Poa gaspensis* (subsequently found in Alaska); *Sagina saginoides* (L.) Dalla Torre, the first from east of the Rockies and south of the Arctic, *Arabis alpina*, etc.] and I got quite a number of mosses. [One of the very rare memoranda regarding the group upon which Collins was a recognized authority.] In the late P. M. we reached Rivière à la Martre (Marten River) and camped about one mile above there on a gravel-beach. Got some fine views of Tabletop Mountain. A few rods above our camp the top of Mt. Albert was seen (our first view of it) over the top of a great ridge". . . The entries for the next three days, including the ascent of Mt. Albert, were earlier copied. That for August 8, continues

"We found the nearest peak (East Peak) about 3650 feet high,

with a still higher peak to the west-northwest. To the south of these there is an immense tableland sloping gently to the southward. The eastern end of this tableland is a great serpentine rock-barren, and the western a bog or meadow. To the south of this is a deep gorge with three large snow-banks in view. Beyond this is the main (highest) part of the mountain—a still larger desolate-looking rock-barren plateau sloping gently to the main dome. We found extremely interesting plants—many of them unknown to Fernald" [*Adiantum pedatum*, var. *aleuticum* Rupr., the first from east of British Columbia; *Festuca scabrella* Torr., a characteristic plant of the arid Cordilleran region; *Danthonia intermedia* of the Rocky Mountains; the beautiful copper-colored *Eriophorum Chamissonis*, in rippling carpets; true *Carex paupercula* Michx., much smaller than the lowland varieties; a host of strange willows in prostrate mats almost solidly enmeshed in rock, the arctic *Salix anglorum* Cham. in three varieties, *S. brachycarpa* Nutt., the first from east of the Rockies, and an amazing little species for a willow, with glabrous capsules and glabrous green scales, the endemic *S. chlorolepis;* very strange species of *Arenaria*, dense masses of wiry marcescent foliage and large pink or white flowers, the new *A. marcescens*, subsequently found only on the serpentines of Newfoundland, a delicate creeping species with fine linear leaves, *A. sajanensis* Willd., elsewhere unknown in America from south of northern Labrador, and a little species with thick oblong leaves, which I described as *A. cylindrocarpa*, a species then recognized only in the Canadian Rockies and in northern Labrador, subsequently found in western Newfoundland and now united with the famous relict of northern Europe, *A. humifusa* Wahlenb.; *Lychnis alpina* L., var. *americana*, of Greenland, Labrador and western Newfoundland; *Statice labradorica* (Wallr.) Hubbard and Blake, var. *submutica* Blake, extending down from the Arctic; the only arctic goldenrod, *Solidago multiradiata* Ait., and another species, a local endemic, with vividly green involucres, the new *S. chlorolepis;* the wide-ranging *Artemisia borealis* Pallas; and the new *Cirsium muticum*, var. *monticola*. We were thrilled, pestered by black flies (to the point of repeating the guides' most frequent expression, "les sacrés mouches") and so confused by novelties on all sides that, as soon as we started to collect one, several

FIG. 1 (upper): NORTHERN AMPHIBOLITE SLOPE OF MT. ALBERT, WITH MARGIN OF SERPENTINE TABLELAND AT RIGHT.

FIG. 2 (lower): SERPENTINE TABLELAND OF MT. ALBERT; WOODED AMPHIBOLITE AREA IN BACKGROUND.

Fig. 1 (upper): Head of Ruisseau à la Neige, Mt. Albert.
Fig. 2 (lower): Treeless Serpentine Wall north of Ruisseau au Diable, Mt. Albert.

others would divert us. The mosscarpet, too, kept Collins absorbed; and singularly enough, sharing the wet depressions in this alpine and wind-swept serpentine barren were such commonplace lowland plants as *Sarracenia purpurea, Geum rivale, Vaccinium Oxycoccus, Kalmia angustifolia* and *polifolia* and *Andromeda glaucophylla*. Yet, where we were making an amazing harvest of novelties and of common boreal herbs and low shrubs, the region was once described by one of the most famous of Canadian geologists as "absolutely destitute of vegetation". Along the western margin of the serpentine tableland a nearly straight line (Plate 702, fig. 2) divides it from a Hudsonian scrub-forest or "puckerbrush", the latter occurring on the amphibolite rock. So sharp is this boundary, that, given the cue, one çould predict the vegetation. On the serpentine occurred the above-mentioned specialties and some more familiar plants: *Carex Bigelowii* Tuckerm. (*C. rigida* of the manuals), *Juncus trifidus, Betula glandulosa* var. *rotundifolia, Empetrum nigrum, Rhododendron lapponicum, Phyllodoce caerulea* and *Arctostaphylos Uva-ursi;* while the amphibolite or hornblendic area was as definitely marked by the abundance of *Hierochloë alpina, Carex capillaris, Luzula spicata, Salix planifolia* Pursh and *S. herbacea, Sibbaldia procumbens, Vaccinium cespitosum* and *Arnica mollis*, never or only rarely seen on the serpentine. On the north-facing slope, just below the tableland (Plate 702, fig. 1), the wet amphibolite below a mass of packed snow and ice was a carpet of species not once seen on the serpentine: *Lycopodium alpinum* L. of the Arctic; *Poa alpina* L. and *Carex bipartita* All., also arctic; *Luzula confusa;* the newly discovered *Streptopus amplexifolius*, var. *oreopolus* (Fernald) Fassett; *Salix cordifolia* Pursh and the new *S. hebecarpa;* the western North American and Siberian *Betula microphylla* Bunge; the arctic *Ranunculus pygmaeus* Wahlenb. and the type of *R. Allenii* Robinson, of the Shickshock Mts. and northern Labrador; *Viola palustris; Epilobium lactiflorum* and *E. alpinum* (*anagallidifolium*); *Cassiope hypnoides;* the Rocky Mountain *Vaccinium ovalifolium* and a beautiful new species, *V. nubigenum; Veronica alpina*, var. *unalaschcensis*, and *V. humifusa; Gnaphalium norvegicum* Gunn. and *Taraxacum lapponicum* Kihlm. In this typically alpine and subalpine vegetation it was amazing to find carpets

of the lowland *Chrysosplenium americanum* and to be able to supplement our limited vegetable-diet with cooked stalks of the common lowland *Heracleum lanatum*, with *Oxyria digyna* and *Arabis alpina* as salad. The contrast between the floras of the amphibolite and the serpentine was so vivid that I was stimulated to a new line of research.] Picking up the journal again: "The black flies on the mountain, especially at the summit, were something fearful and we were obliged to wear improvised head-nets (Plate 704, fig. 1) and even then there was little comfort. . . . I have never seen anything like them." . . .

"August 9, 1905, Wednesday. Spent all A. M. putting up plants collected yesterday. Were obliged to do this inside cheesecloth canopies [in a 6-foot lean-to] to keep away from 'brûlots' (midges), black flies and mosquitoes." . . . .

"August 12, 1905, Saturday. . . . At about ten o'clock we all started for Snow Brook Ravine (Ruisseau à la Neige) collecting. . . . Before reaching the great snow-arch we were caught in a shower or two. These showers continued most of the P. M. At one time we got under the snow-arch to get out of the rain. The arch (Plate 703, fig. 1) was formed by the brook flowing underneath the great snow-bank and was some twenty-five feet high." Besides more willows, the great prize of the day was *Polystichum mohrioides*, var. *scopulinum* (D. C. Eaton) Fernald (Plate 697, fig. 2), the serpentine of Mt. Albert the only region for it east of Idaho.

"August 14, 1905, Monday. Snowing and hailing most of the early A. M. The temperature was below freezing in the morning and in the late afternoon 37 degrees. Slept cold last night. Tabletop Mountain, ten miles away, was covered with snow. . . . Fernald and Joe went off to the ravine to the eastward about 2:30 P. M. . . . I got back about 7:00 P. M. Temperature 42 degrees".

"August 15, 1905. Clear and cold. Got up about 3:30 A. M. on account of cold. [I well remember the greeting from Coté, in characteristic Canadian French, as I crawled out of the tent: 'Fer fret cum job' ('Il fait froid comme le Diable')]. Fernald and I worked on the plants until 10:30 A. M., when Edouard and Hector started down the mountain with large packs. About noon Fernald, Joe, Coté and I started down (Plate 704, fig. 2) . . . Flies bad."

Out on the coast, away from the freezing alpine conditions of mid-August, we explored along shore, fascinated by the giant *Senecio Pseudo-Arnica* (shared with the Bering Sea region), *Plantago eriopoda* Torr., a species primarily of the alkaline Canadian Plains, and other maritime or halophytic types. We were delighted, too, with the great areas, at the mouth of the river, of the very fleshy *Hippuris vulgaris*, var. *maritima* Hartm., a rare plant as shown by herbaria. Driving down river to Pointe Tourelle, Cap Tourelle, Rivière Patate and Ruisseau Castor, we called in to see that the type-colony of *Arnica gaspensis* was intact and spent much of the time exploring and botanizing about the remarkable natural bridges and fantastically weathered sea-stacks and tower-rocks which gave the name Tourelle. The Rocky Mountain *Woodsia scopulina,* new to the flora of the East, abounded in some of the crevices. *Draba glabella* Pursh, with the endemic lower St. Lawrence var. *orthocarpa* and the very definite var. *megasperma,* more or less alternated on the cliffs, and *Festuca* was a complicated group, with *F. rubra* often represented by the arctic vars. *mutica* Hartm. and *arenaria* (Osbeck) Fries, and the *ovina*-series by *F. saximontana* Rydb.

In 1906, vividly conscious of the sharp contrasts in the floras of the acid areas, the serpentine and the calcareous rocks, we undertook a thorough collection of typical plants and the rocks upon which they grew, Harley H. Bartlett, then a student with me, being ready to undertake the chemical analyses. Equipped with a steel frying-pan and abundant cloth bags we started in at Bic, placing the thoroughly washed plants on the hot pan and allowing them to ignite over a bed of hot coals without the use of matches. Collins entered whole-heartedly into this collecting and, already knowing much of the country to be visited, we planned to secure the samples of plant-ash, rock and soils without making many new discoveries. At Bic, of course, we got to some new territory, the ragged and castellated white cliffs toward St. Fabien (Plate 706, fig. 2), as well as Cap Orignal (Moose Cape) and some others and, inevitably, new discoveries were in order. The greatest shocks, however, were when we got back and Bartlett proceeded with the analyses. *Saxifraga Aizoon* is famous for having the large stomata along the leaf-margins heavily incrusted with insoluble calcic carbonate,

waste thrown off through the stomata; it obviously should occur on calcareous rocks. On one big cliff near Bic it was very handsome, growing on what seemed like quartzite. We accordingly got a large sample of the plant-ash and good samples of soil and rock. When Bartlett got hold of them repeated analyses showed the ash of the plant to contain a large amount of calcium, the soil and the rock to be pure silica! Rock-samples were referred to the petrographer, the late John Eliot Wolff, and he, too, said "quartzite." That was that! On the base of Cap Orignal, a headland wholly unlike those around, both in its rock and its weathering, *Iris setosa*, var. *canadensis* abounded. We consequently got good samples. When the analyses were made the ash of the *Iris* showed abundant manganese, the rock-sample only a trace. Again, there we were! Bartlett went through hundreds of samples, sometimes finding what was expected, sometimes just the opposite, and in the end, realizing that the analyses were not repeating the operations of the plants, he declined to publish the inconclusive results. In the analyses it was not possible to repeat the activities of the roots in attacking the hygroscopic film about each soil-particle nor the ability of the plant to draw alkaline salts from the fogs and mists along shore. Although *Saxifraga Aizoon* was on pure silica, the heavy fogs, apparently, supplied it with the calcium it required. All this was unknown to Collins and me at the beginning of the season and we spent many hours daily in conscientiously assembling the ash.

We had arranged in advance with Sam Coté to have the provisions all bought and packed into the Gaspé canoes (dugouts), so that we could start immediately up the River Ste. Anne des Monts. With the aid of my French dictionary we had drawn up two pages of required provisions, but on reaching Ste. Anne des Monts we found Coté and the storekeepers in perplexity. Everything was clearly understood and the supplies had been properly stowed except two: "*pommes de terre*" and "*jambon.*" Proceeding to the market we pointed out what we meant, *patates* and *becking*. *Pomme de terre* in Gaspé is the mountain cranberry, *Vaccinium Vitis-Idaea*, var. *minus*, which carpets the mountains; *patate*, the early French name, was the word brought from France by the original settlers of Gaspé. Later, after the guides

had packed more than ten miles through the woods, thence up the steep walls of Tabletop, when we suggested attacking the 20 pounds of "prunes", they got out a quart can of Green Gage Plums, mostly water; we went without the less costly and more desired *prunes sèches*.

Going this time to Ste. Anne des Monts,

"July 11, 1906, Wednesday. Started from Little Métis with Paul Marmon as driver at 7:30 A. M. Arrived at Matane (33 miles) at noon and had dinner . . . Started on again at 2:15 P. M. and reached Les Méchins at about 8:30 P. M. (45 miles), making about 78 miles from Little Métis with one horse." . . .

"July 12, 1906, Friday. Left Les Méchins about 7:30 A. M. and drove leisurely [because stopping for a good deal of botanizing, on this drive becoming much impressed with a small tree with the largest fruiting aments and the largest leaves we had ever seen on a willow, the new *Salix laurentiana,* endemic on the shores and bluffs of the Gulf of St. Lawrence and closest related to *S. Hookeriana* Barratt, of the Pacific coast from southern British Columbia to California] to . . . Ste. Anne des Monts. Found Coté and Joe Fortin there. In the late P. M. we reorganized baggage", and at 10 next morning started up-river. A disgruntled and very boastful rough-neck, whom we will call Zéphirin Violette, was at the starting-point, wildly gesticulating and assuring us that we had a miserable crew, that Coté knew nothing about the woods—in short, that we ought to have employed him. Consequently, when we stopped at noon to "boil the kettle" and found the axe gone, we knew who had removed it. One canoe was sent back to get another axe and Collins and I took off time to botanize. The next time we were organizing an expedition, the Mt. Logan trip of 1923, we received a letter, written in flowing English and a fine bookkeeping hand, from one of our former guides, urging us to take Zéphirin into the party; he was a splendid fellow and heartily ashamed of the way he had acted. Fortunately, before we could answer, the following self-explanatory message arrived:

"Wen i rot you las nite i had Mr. —— at the store in Cap Chat rite for me i axe you to hire Zéphirin Violette i had to he stood there an' made me he is a liar please rite me and say you don want nothink to do of Zéphirin Violette." We so wrote.

While waiting for the axe and during a leisurely ascent of the river for some days we watched the plants, as we had not done in the hurried trip of the year before. *Listera auriculata, Primula mistassinica* and *Pinguicula vulgaris* carpeted the damp slopes, usually overhung by *Lonicera involucrata;* and wherever there were spring-rills and small brooks coming in *Arnica mollis* and *Arabis alpina* L. made great displays, with the gravels bearing the usual solid carpets of *Dryas Drummondii* and *Epilobium latifolium* (Plate 698, fig. 2). All these were now quite familiar, but the goldenrod of the gravel-flats seemed strange, the Rocky Mountain *S. lepida,* var. *elongata* (Nutt.) Fern. On one wet slope the *Erigeron* puzzled us, *E. elatus* Greene of the Canadian Rockies; and, topping off breakfast one morning by picking some wild strawberries, we found ourselves instinctively neglecting the tiny ones—until it dawned upon us that they were on many-crowned and nonstoloniferous half-shrubs with tiny leaves, the unique and strictly endemic *Fragaria multicipita.* At another point, when we left the canoes in order to decrease their loads, we walked into a carpet of a strange little round-leaved willow, *Salix obtusata,* so strange that its relationship in the genus has not been made out.

This trip up-river was full of thrilling incidents.

"July 16, 1906, Monday. Cooler, 66 at 6:00 A. M. Very hazy and smoky. Not many flies to bother us last night. Used a joss stick in the canopy before going to sleep. Got up about 5:30 A. M. and had a bath in the river. Took Coté's trout-rod and caught a salmon. Coté and Joe helped me land him. [Collins omitted to state that the entire camp was roused by his shout, 'Help, help!' He had stepped into the stern of one of the emptied canoes, drawn part-way out of the water, and the fighting salmon was towing the canoe (without poles or paddles) swiftly down the Grand Rapid, when Coté and Joe, paddling with all their might, caught the speeding canoe and brought back the two heroes of the episode.] Warm in middle of the day —82 about noon. . . . Saw a large Canada lynx trying to catch some ducks. Portaged past Little Sault", our station for *Salix obtusata.*

The journal of much of the Mt. Albert trip may be omitted, except to note that we had great difficulty making many of the

FIG. 1 (upper): FLYS BAD, ON MT. ALBERT (COLLINS, SAM COTÉ, FERNALD AND JOE FORTIN, from left to right).
FIG. 2 (lower): BREAKING CAMP, MT. ALBERT (SAM COTÉ AND JOE FORTIN).

Fig. 1 (upper): Triangular Pond, Tabletop Mountain.
Fig. 2 (lower): Across northern End of platter-like Tableland of Tabletop Mountain (Gorge of Rivière Madeleine at right in distance).

plants from the serpentine barrens ignite. They had grown on silicate of magnesium and had some of the properties of asbestos or of soapstone. On the steep and treeless north wall of Devil's Gulch (Ruisseau au Diable) we got *Pellaea densa* (Brack.) Hook., a characteristic species from southern British Columbia to southern California, here growing with the still rarer *Polystichum mohrioides*, var. *scopulinum*, Plate 697, fig. 2, already referred to; and in collecting them we found ourselves kneeling in a carpet of *Epigaea repens!*

From the eastern border of Mt. Albert we figured out a route from the Forks of the Ste. Anne des Monts across to Tabletop; and on the 26th Coté and Roy went down to the river-camp and started to blaze a trail to that vast tableland. In the evening of the 28th, just after we had come down to the river, the two trail-makers came in, haggard, pale and unnerved. They had been "through Hell", nearly died of thirst and were bleeding from fly-bites. "Nothing" would induce them ever to go again "through Hell". Discussion of the matter was not then in order; embracing, soothing, hot supper and bed were the best cure; and when, after a quiet Sunday, they realized that everyone at Cap Chat and at Ste. Anne des Monts knew that Coté was guiding an expedition to little-known Montagne de la Table, they decided to take us in, that we might see for ourselves. Upon leaving the river they had found old blaze-marks on trees. These they had followed, taking exactly the course we had figured out from Mt. Albert, for they had hit upon the old route of A. P. Low, who, when exploring for the Geological Survey of Canada, had also started from the Forks.

"July 31, 1906, Tuesday. Clear all day. After breakfast at the Forks we packed up our things and started at 9:00 over Low's Trail for Tabletop. It was a long, hard tramp—ten miles by pedometer. Arrived at a small lake, at the foot of Tabletop, called by Coté 'Lac des Américains', at 6:15 P. M."

"August 1, 1906, Wednesday. Had a headache in the A. M., so stayed about camp most of time. In the P. M. Fernald and I made a circuit of the lake and got some interesting plants [carpets of *Isoëtes macrospora* and of *Subularia aquatica*, etc.] Coté been up the mountain cutting trail most of the day. Joe, John and Wilfred gone down to the Forks for second load of

things. Trout abundant in the lake. In less than one hour I caught 35 trout with the ravellings from my khaki trousers as bait for the first fish, then used a trout-fin for the rest. Fernald came in to camp a little later and as a result of his hour's fishing had 36 trout, the largest being 7½ inches long. He caught all from a rock, with the fin of one fish as bait for all but the first".

"August 2, 1906, Thursday. Hazy from smoke. Spent the early A. M. taking care of plants. About 9:30 A. M. Coté, Fernald and I started up the mountain via Low's Trail, going from camp to that trail via one cut by Coté. Reached top of first spur, very dry (2970 feet) . . . From here we worked east and then north to the top of a high peak which was 3760 feet altitude. We then went north to the edge of the next ravine, east along its upper edge and then down to a rectangular-shaped pond—one of six seen in the gorge". When, coming over the crisply dry ridges, we suddenly saw these (Plate 705, fig. 1) and, a little later, a hundred other ponds occupying the broad platter-like top of Tabletop, Coté's gloom suddenly passed; this was a promising moose-country and he would return in the autumn. He had "gone through Hell" unscathed and was reaping his reward. Returning to Lac des Américains we caught 75 more trout. These we cleaned, and when, next morning, we formally moved to a camp-site near the rectangular pond of the day before, these were put into a rubber blanket and carried up the mountain, to piece out the dry foods coming in from the Forks. As it subsequently proved, all the larger lakes and ponds of the Madeleine River system were paved with very hungry trout waiting to be eaten; incidentally *les savons* (partridges, especially the spruce partridges or fool-hens) were very abundant and tame. By throwing a stone or a botanizing-pick we could easily stun them, and in ten minutes they were over the fire. We did not soon hear the end of those stale trout!

Collins's entry for August 4 contains these items: "I tried to make a map of the ponds (large and small) up as far as the first large one above camp. Mapped 45—numbered them in a sketch I made. Got *Polytrichum* eighteen inches long." Later on our ingenuity gave out; we could think of no more names for ponds. There must be many hundreds of them.

"August 7, 1906, Tuesday. Clear in the A. M. Cloudy in the

P. M. Rainy in the evening. Had breakfast of trout, partridge, etc., and about 8.30 Coté, Joe, Fernald and I started down to Triangular Pond (PLATE 705, FIG. 1) and across to Graniteblock Pond, up to Second Peak where I took a panorama. Coté and I then went across the Third Peak while Fernald and Joe worked around Pond no. 101 (southeast of Third Peak). Took panorama from Third Peak. . . On the way from Second to Third Peak I went along edge of barrens above Pond no. 201 and found *Dryas integrifolia* and several other interesting things. [The peaty meadows, bogs and pond-margins in the platter-bottom were semi-temperate, partly arctic-alpine, with a grand mixture of such plants as *Eriophorum tenellum*, temperate American; *E. Chamissonis*, boreal; *Carex rariflora*, arctic-alpine; *C. lenticularis*, var. *albi-montana* Dewey, mostly alpine; *C. limosa*, north-temperate; *C. oligosperma*, temperate North American; *C. saxatilis* var. *miliaris*, boreal American; *Salix argyrocarpa*, alpine; *S. arctophila* Cockerell, the first from south of northern Labrador; *Rubus Chamaemorus*, subarctic; and *Petasites vitifolia* Greene, west-American. The ponds had an equally north-temperate aspect: *Potamogeton epihydrus*, var. *Nuttallii*, temperate North American; *Nuphar variegatum* Engelm., temperate American; carpets of *Subularia aquatica*, circumboreal, and of *Isoëtes macrospora* (boreal American); the newly discovered *Callitriche anceps* (subsequently found in Greenland, Labrador, Newfoundland, and on Mt. Mansfield, Vermont); and *Myriophyllum Farwellii* of the northern states and southeastern Canada. Joe became very keen at detecting specific differences and, although he had never heard of such erudite subjects as grammar, syntax and rhetoric, he promptly got hold of the Latin names. He and I worked much together, each of us taking one side of a pond. I well remember calling across, 'Is there anything new over there, Joe?' and receiving the immediate reply, 'No, there's nothing here but *Subularia aquatica* and *Isoëtes macrospora*.' The region of Tabletop where we camped was of highly feldspathic pink granite, and the dry slopes and crests supported the usual alpine and subalpine plants of granitic mountains, rather notable through the absence of *Arenaria groenlandica*, which we found only once (on one of the easternmost crests). Toward the northwest and north, in the area we

visited, the outer walls were of calcareous rocks, as if the granitic mass, as it rose, had carried with it a northwestern fringe of limy rock from below. It was this edge which Collins reached when he noted *Dryas integrifolia*.] After lunch we all went back to this place and worked the barrens above Pond no. 201 and also to some extent the upper slope of the next ravine north of no. 201. Found a good many interesting plants", including the following calcicolous species: *Juncus castaneus* Sm., the first from south of Labrador; *Tofieldia palustris*, a wide-ranging boreal species; a remarkable willow with large persistent stipules, *Salix calcicola* Fern. & Wieg.; the then undescribed and essentially endemic *Draba Allenii;* a little rosulate *Saxifraga*, resembling the arctic *S. nivalis* L., but with minute cuneate petals, the new *S. gaspensis*, subsequently found in northern Labrador and abundant with *Draba Allenii* on the calcareous schists of the Mt. Logan area; *Epilobium Drummondii* Hausskn. of the Rocky Mountains; *Pyrola grandiflora* Radius, the tiny-leaved and large-flowered arctic ally of *P. rotundifolia; Pedicularis flammea* L., another arctic species at the first station known south of northern Labrador; *Campanula uniflora* L. ditto; a brand new goldenrod, the endemic *Solidago mensalis;* and the beautiful discoid *Senecio* with purple involucres and deep orange disks, the Cordilleran *S. pauciflorus* Pursh. In spring-rills of this area *Cerastium cerastioides* (L.) Britton, an anomalous arctic plant, almost as well placed in *Stellaria*, abounded. Another afternoon, while Collins was working over his mosses, I returned with Joe, further to explore the walls of this "Marble Ridge". A leaf somewhat suggesting a *Taraxacum* but mottled and surely not belonging to *Taraxacum* because the young scape was solid and the young phyllaries ciliate, greatly puzzled me, and better material was secured of some of the other specialties. Unfortunately, Joe was in an insubordinate mood and I soon told him to go back to camp. He had forgotten that we were not out merely for his personal gratification. Very soon, however, I regretted that I was alone, for on the treacherous scree I twisted my ankle and immediately one of my expensive high boots chafed the injury, and I was forced alternately to hobble and crawl four miles back to camp, arriving there quite exhausted and having lost the strange Composite. (In 1923 this proved to be the new *Agoseris gas-*

pensis, a species subsequently found elsewhere only on mountains of northern British Columbia). Evidently Joe did not tell Collins why he went back to camp alone, for the record simply reads: "Joe came back in late P. M. to get some firewood. Fernald went on alone from Pond no. 201 to Marble Ridge. He came in long after dark, having had a hard, slow trip home on account of one of his boots skinning an injured ankle. He gave the boots to Joe when he got back"; the gift intended to heap coals of fire on the head of the rebel, who promptly put on the boots and wore them the rest of the trip!

At the northeastern border of the platter-bottom of Tabletop some of the high domes are of a whitish syenite, consequently slightly calcareous. We got to this region, draining into the Madeleine River, only for a short side-trip in August, 1906, just enough to show how different it is from the granite area where we had chiefly camped.

"August 9, 1906, Thursday. Very cold last night. Fernald and Joe got up about 4:30 A. M. After breakfast Joe, Coté, Fernald and I started for the eastern edge of the mountain at 8:45 . . . went up the 'South Dome' [Botanists' Dome of Coleman's report] and built a cairn for marking spot—altitude 4100 feet. Fernald, Coté and Joe started southeast to a lake we called 'Lac Coté' to make camp, while I went up on the big main dome alone and built a cairn [Mt. Jacques Cartier of recent Canadian maps]. Big dome 4250 feet. . . On the way down found Fernald collecting *Phegopteris alpestris*, new to eastern America"—not only new to eastern America, but new to science, for it is the endemic *Athyrium alpestre*, var. *gaspense*.[1]

"August 14, 1906 . . . Left our camp in the ravine of the East Fork of the Ste. Anne River at 7:45 A. M. in a dense fog. Came down over the regular Low's Trail. . . . Reached our old camp at the Forks at 6:15 P. M. Pedometer 12 miles. Altitude 675 feet, which means that 30 to 50 feet should be added to all altitudes taken on Tabletop Mountain."

[1] In the 1923 trip to the northeastern region of Tabletop after Collins had returned home, the smaller half of our large Mt. Logan party, Carroll W. Dodge, Lyman B. Smith and I, found in this syenitic area a great many additional species: *Carex capitata;* the famously localized *C. macloviana* D'Urv. (of the Falkland Islands and Patagonia and scattered spots in arctic and subarctic regions); the arctic *Saxifraga cernua* L. and *Gnaphalium supinum;* the almost endemic *Agoseris gaspensis*, finally in flower and young fruit, and many other rare things.

"August 16, 1906. Very cold in the tent towards morning. Clear now. Temperature 40 degrees."

In 1907 Mrs. Fernald and I took a delayed honeymoon to Bic and to Percé, with Collins as the third member of the party. These regions having been already covered by the preceding narrative, only a few items need mention. At Bic we regularly left the hotel after breakfast and arranged for a hearty evening meal, taking with us for lunch only bread, butter, tea and some sweets. When M. Pineau expressed surprise that we needed so little we explained to his horror, that we regularly cooked clams, mussels or mushrooms and wild vegetables; that was terrible, clams and mussels were deadly poisonous (as were mushrooms) and used only for fish-bait, and only cattle ate wild plants! With a recruit in the party we explored many new spots, roped precipitous cliffs (Plate 706, fig. 1) to get at herring-gulls' nests, and otherwise shocked the staid people of Bic who had never seen a woman scale vertical walls. Where the herring-gulls had their nests, *Draba minganensis*, *arabisans* and *glabella* and *Primula laurentiana* were stripped of flowers, fruit and new foliage. Elsewhere they were intact; only one inference was obvious.

Then we went on to Percé, again revelling in the work with the alpine rope. We had all been very seasick during a stormy trip on the "Lady Eileen", from Dalhousie to Percé, arriving at about 3 A. M. I shall never forget the breakfast at 3:30 A. M. at M. Le Boutillier's, such a contrast to our meals the first summer at Percé—heaping platters of lobster and of "Gaspé oysters" (cod-tongues and sounds), our introduction to the latter delectable dish. The cliffs of Grande Coupe (Plate 707, fig. 2) were reclimbed (with difficulty on account of "overhang") and those of Mt. Ste. Anne again raked for specialties; but the great new trip was to Bonaventure Island, a long red calcareous-conglomerate island, famous as one of the great breeding haunts of gannets, puffins and other sea-birds. The people at Percé, on the mainland, are derived from French-speaking ancestors, originally from Jersey. Their distant cousins on Bonaventure Island often can not talk to them for, although also from Jersey, they came much later and speak only English. "Willie" Duval, long familiar to tourists (who, in 1907, were unknown) took us over in his sailboat and we spent two wonderful days on

the Island. On the overhanging shelf of rock (PLATE 707, FIG. 1) where we landed there was a strange grass, the new and endemic *Puccinellia macra* Fern. & Weath.; and all the way from the landing to the Duval house we walked on Drabas, Euphrasias and other choice plants which form much of the turf. There was, naturally, a great temptation to spend our time on the rope, down among the tens of thousands of nesting gannets, razor-billed auks, sea-pigeons and other inhabitants of the cliffs. The old gannets, with wing-stretch of 6 feet or more would leave the young on the shelves of rock and, flying in great circles about us, shout "go-rock! go-rock! go-rock!" No plants grew down among the crowded nests, however, and we, consequently, returned to the turfy crests (PLATE 700, FIG. 2) collecting most of the Percé specialties and getting particularly fine material of *Draba pycnosperma* (often eaten off); *Epilobium glandulosum* Hausskn. of the North Pacific region; *Oxytropis johannensis*, described from the upper St. John in Maine; the tiny *Sagina procumbens*, var. *compacta* Lange, the arctic extreme of the species, not previously recorded from south of Greenland; *Euphrasia purpurea* Reeks, described from Newfoundland; and *Descurainia Richardsonii* (Sweet) O. E. Schulz, of the Rocky Mountains.

That trip closed for many years my long expeditions with Collins. His duties in government work kept him from joining the parties which spent succeeding summers in Nova Scotia and Newfoundland, so that our work together consisted then of occasional week-end exploration of pond-shores and swamps of Rhode Island. On these brief trips in his adopted state we were able to add to the known flora of the state some nice things (*Rhynchospora Torreyana*, *Eupatorium leucolepis*, var. *novae-angliae*, etc.), but these are insignificant in comparison with his own discoveries in the state. In 1923, however, Collins got off long enough to spend much of July in the party which went to the Mt. Logan region of Gaspé. The preceding summer Pease and I had tapped the region, one of calcareous schists, whereas Mt. Albert to the east is serpentine and amphibolite and, still farther east, the small part of Tabletop we knew is granite or syenite, with marble and other calcareous rock at the north-western edge; and from our very brief visit Pease and I knew

that another alpine flora was on Logan. Whereas our first trip into the Shickshock Mountains had been by Gaspé canoes up-river, we now left Cap Chat in automobiles[1] and drove to the farm farthest up Rivière Cap Chat, Émond's. There the party, Pease, the late Kenneth K. Mackenzie, Ludlow Griscom, Carroll W. Dodge, Lyman B. Smith, Collins and I, with the guides, transferred the collecting- and camp-equipment and the foodstuffs to lumber-wagons and proceeded by lumber-road to up-river headquarters in a log-cabin about west of the Mt. Logan range. Thence we packed across to the high basin which lies under a steep escarpment below the summit-levels of the Mt. Logan system and after much preliminary botanizing moved our camp to a higher level and continued work there. The physiographic details of this mountain-area have already been discussed and illustrated elsewhere.[2] I need not go into them here. This trip and the one preceding it yielded, as we had thought, a great many important additions to the Shickshock flora. Of course the more or less ubiquitous alpines are there but there are many specialties. The cool slopes are most frequently carpeted with the beautiful *Salix vestita* (Plate 699, fig. 2), with an abundance of *Draba Allenii*, otherwise known only on Tabletop, or of the new and endemic *D. clivicola*, with *Barbarea orthoceras* Ledeb. of Siberia and northwestern America abundant. *Saxifraga cernua*, *S. rivularis* and the local *S. gaspensis* are frequent. In some of the chimneys *Arnica louiseana* Farr, of Lake Louise in the Canadian Rockies, abounds; in others there are endless variations of *Senecio resedifolius* Lessing, of the Bering Sea region and the Altai of Siberia. On some of the alpine meadows *Epilobium boreale* Hausskn. of Alaska, *Galium Brandegeei* Gray, of the

[1] Many incidents, some merely amusing, some almost tragic (like the overturning of one of the automobiles or the dropping of a horse through a weak corduroy) occurred. These can hardly be enumerated here. One, however, was so amusing that it must be told. Mackenzie, always dogmatic, promply resented the British government's allowing the French Canadians to speak anything but English. He refused to recognize any other language and would not concede the "*si'l vous plait*" and "*merci*" necessary for a smooth passage through the country. Griscom, early educated in France, spoke better than the natives and at Lefrancois', when dinner was nearly finished, he would quietly explain to the waitress that M. Mackenzie was terribly hungry (in fact a gourmand); and when large new helpings were set, to his amazement, at Mackenzie's place, the joker would calmly reach over and draw them to his own place.

[2] Collins and Fernald, *The Region of Mt. Logan, Gaspé Peninsula.* Geogr. Rev. xv. 84–91, with map and illustr. (1925).

Fig. 1 (upper): Cliff-climbing at Bic (Margaret H. and Merritt L. Fernald descending to Herring-Gulls' Nests).
Fig. 2 (lower): Castellated Cliff west of Bic.

Fig. 1 (upper): Our Landing-Place, Bonaventure Island, Type-station of Puccinellia macra.
Fig. 2 (lower): Overhanging Wall of Grande Coupe, Percé.

Rocky Mountains, and *Luzula sudetica* (Willd.) DC., of arctic-alpine Europe occur. The pass between Mts. Fortin and Mattaouisse is distinguished by the arctic *Potentilla emarginata* Pursh and *Draba nivalis* Liljebl., at their first known stations south of northern Labrador, and the arctic *Carex norvegica* Retz. (*C. alpina* Swartz), also at its first station so far south. One ridge gave us the high-arctic *C. nardina* Fries, while the slope beneath bore the Rocky Mountain *Arenaria macrophylla;* bare crests had the Mt. Washington *Euphrasia Oakesii*, and on the tablelands two new species of *Antennaria* are noteworthy, the strictly endemic *A. Peasei*, and another, *A. vexillifera*, shared with the lime-barrens of western Newfoundland.

The Mt. Logan trip was as worth-while as Collins's and my introductory trip to Gaspé twenty years earlier. It was a fitting climax to our work together in that fascinating country. Our first season, at Bic, Carleton, on the Little Cascapedia and at Percé, yielded scores of species never before known south of the St. Lawrence or east of the Rocky Mountains or even the Pacific slope, with a good share new to science; the last trip was almost as productive. Although the Gaspé flora had been earlier explored by John Macoun, John A. Allen and some others, they left plenty to be discovered.[1] There is much more to be found; but with the self-sacrificing, financially unsupported and unremunerated but always skillful and cheerful coöperation of Collins a real start was made; without it little would have been accomplished. In 1903 Gaspé meant nothing to botanists[2]; by 1907 it had become famous as one of the botanically unique regions.

Throughout his active period of collecting Collins was primarily interested in Bryophytes. His collections and memoranda

[1] One Canadian botanist, prominent on account of his official position but given to "plain thinking and high drinking," repeatedly wondered at our finding so much about Percé. He went there every summer and "never could find anything of interest." One doesn't if he sits about the front porch or in the bar.

[2] Collins and I, with no grants in aid of our work, tried, without much success, to get back a small part of the expenses of our trips by selling uniform sets of the Gaspé material. A letter from St. Petersburg (now Leningrad) stated that their herbarium was already rich in Alaskan plants and that they needed no more! "Gaspé Peninsula, Quebec," meant nothing to their geographic sense. Specific and varietal names like *aleuticum, sitchense, alaskana, unalaschcensis, Menziesii, oregana, Douglasii, dawsonensis, Bongardiana, beeringiana, Romanzoffiana, Fischeriana, Chamissonis, mandjuricum, sajanensis, davuricum, sibiricum, kamtschaticum, Langsdorfii, Kotzebuei, Gmelini* and *tatarica* sufficiently indicated the region.

on the mosses are invaluable. Of these, his chief interest for years, I am unable to write; but I constantly recognized the care with which he collected and the endless pains he took to have his data accurate. His own collections, presented to the Gray Herbarium, the Farlow Herbarium and the New England Botanical Club, will always be a reminder of his thoroughness. When, gradually dropping his activities through an increasing paralysis, he asked C. A. Weatherby and me to come to his apartments, to move his herbarium and library while he could yet oversee the transfer, he said with his accustomed cheerfulness: "I've had more than forty years of satisfactory exploration and botanizing. What more could one ask?", not mentioning the fact, that for four decades he had looked forward to his years of retirement, when he would concentrate upon his mosses. The paralysis of his hands, while his brain and eyes were still acute, prevented the delicate manipulation necessary for that work. And as we packed the books and papers, preliminary to his moving to a sanitarium, he retained his diaries because, with them before him, he could live over again his long period of active field-work.

The many photographs taken by Collins naturally include few of himself and those are in groups, taken when he had joined the party after setting his camera.[1] He did, however, delight in photographing plants in their natural habitats. It seems fitting, therefore, to add to this account of our field-work together a few of his photographs, some of scenes or incidents in our work together, some of plants rarely pictured. These I offer as a slight recognition of the genius of a sincere and wholly unselfish friend.

Appendix I.

Those who follow us may be glad to have a brief summary of the regions in eastern Quebec and the seasons of collecting by Collins and me. They are as follows, with the addition of other trips to eastern Quebec by myself or those exploring with me or influenced by Collins or me to visit the region.

[1] A characteristic picture of Collins on the alpine rope is in Fernald, *Botanizing on the Gaspé Sea-cliffs*, Harvard Alumni Bull. xxxiv. 419–425—repr. 1–7 (1932).

1902

E. F. Williams and M. L. Fernald, late July and early August: Matapedia, Bonaventure County; mouth of Bonaventure River and region of New Carlisle and Paspebiac to Port Daniel, Bonaventure County; Rivière du Loup, Temiscouata County; St. Alphonse, Saguenay River, Chicoutimi County.

1904

G. H. Richards and M. L. Fernald, late June: valley of Grande Rivière, Gaspé County.

M. L. Fernald, late June: Escuminac, Bonaventure County.

J. F. Collins and M. L. Fernald, July 11–13: Rivière du Loup and Cacouna, Temiscouata County. July 14: St. Alphonse, Saguenay River, Chicoutimi County, and Tadousac, Saguenay County. July 15–18: Bic and vicinity, Rimouski County. July 19: Matapedia, Bonaventure County. July 19 and 20: lower Nouvelle River and region of St. Jean l'Evangéliste, Bonaventure County. July 21 and 22: Carleton and Tracadigash Point, Bonaventure County.

J. F. Collins, M. L. Fernald and A. S. Pease, July 23–27: Carleton and vicinity, and Tracadigash Mountain, Bonaventure County. July 28 and 31 and August 1: New Richmond, Bonaventure County. July 29 and 30: Little Cascapedia River to slightly above the Forks. August 2 and 3: about mouth and lower islands of Bonaventure River. August 5, 6 and 8: Bonaventure River as far up as Mt. Baldé. August 11–15: region about Grande Rivière, Gaspé County. August 16: Grande Rivière to Percé. August 16–19: region of Percé, Gaspé County. August 20: Percé to Douglastown, Gaspé County, collecting slightly on southwest slopes of Percé Mountain and at Barachois. August 21 and 22: region of Douglastown and Seal Cove River. August 23: lower Douglastown River. August 24: Douglastown to Gaspé Basin. August 24–27: region of Gaspé, York, and lower Dartmouth River.

Fayette F. Forbes, July, August: Rivière du Loup to Ste. Anne des Monts.

1905

E. F. Williams, J. F. Collins, M. L. Fernald and others, July 5 and 6: Rivière du Loup and Cacouna, Temiscouata County. July 6–10: region of Bic, Rimouski County. July 12–15 (with Oakes and Blanche Ames) and July 17: valley of Grand Cascapedia River, Bonaventure County. July 16: region of New Richmond, Bonaventure County. July 18–21: region of Carleton and Tracadigash Point, Bonaventure County. July 23–26: region of Percé, Gaspé County, July 27: Percé to Gaspé Basin. July 28: region of Gaspé Basin. July 29: lower York River, Gaspé County.

J. F. Collins and M. L. Fernald, July 31: Mont Louis, Gaspé County. August 3–7: valley of Rivière Ste. Anne des Monts, up to the Forks, Gaspé County. August 8–15: Mt. Albert, Gaspé County. August 19–21: mouth of Rivière Ste. Anne des Monts to Ruisseau Castor, Gaspé County. August 24: Father Point, Rimouski County. August 24: Rivière du Loup.

1906

J. F. Collins and M. L. Fernald, July 3–8: region of Bic. July 10: Little Métis, Matane County. July 11 and 12: Little Métis to Ste.

Anne des Monts. July 13–17 and 30 and August 15–17: Rivière Ste. Anne des Monts, up to the Forks. July 18–28: Mt. Albert. July 31: Forks of Rivière Ste. Anne des Monts to Lac des Américains. August 1: Lac des Américains. August 2–13: northern end of Tabletop Mountain (Montagne de la Table), Gaspé County. August 14: Tabletop to Forks of Ste. Anne des Monts (Low's Trail).

1907

J. F. Collins, M. L. Fernald and Margaret H. Fernald, July and August: regions of Bic and of Percé.

1910

K. M. Wiegand and M. L. Fernald, late July and early August: Blanc Sablon, Straits of Belle Isle, eastern Saguenay County.

1912

M. L. Fernald, E. B. Bartram, Bayard Long and Harold St. John, July: Magdalen Islands.

M. L. Fernald, Bayard Long and Harold St. John, August: Magdalen Islands.

1914

Harold St. John, August: Brion Island and Bird Rock, Magdalen Islands.

1915

Harold St. John, June–September: Côte Nord eastward to Straits of Belle Isle.

1922

M. L. Fernald and A. S. Pease, July and early August: Lévis to Marsouin River, Gaspé County; Rivière Cap Chat and western section of Mt. Logan region, Matane County; Mt. Nicolasbert, Matane County.

1923

J. F. Collins, M. L. Fernald, A. S. Pease, K. K. Mackenzie, Ludlow Griscom, C. W. Dodge and L. B. Smith, July: Rivière Cap Chat and Mt. Logan region, Matane County; Rivière Ste. Anne des Monts and Mt. Albert, Gaspé County.

M. L. Fernald, C. W. Dodge and L. B. Smith, August: Rivière à Pierre to Lac Pleureuse, and northwestern region of Tabletop Mt., Gaspé County.

N. C. Fassett and H. K. Svenson, August: lower St. Lawrence and Baie des Chaleurs.

1925

K. M. Wiegand, M. L. Fernald, Bayard Long, F. A. Gilbert and Neil Hotchkiss, early September: Blanc Sablon and Blanc Sablon River to Bradore, and Mutton Bay, Saguenay County.

1927

S. L. Kelsey and P. H. Jordan, late July: north coast of Gaspé County.

1928

A. S. Pease, mid-July: Cap Rosier and vicinity, Gaspé County.
Arthur F. Allen, July and August: valley of Rivière Cap Chat and Mt. Logan region, Matane County.

1931

M. L. Fernald, C. A. Weatherby (and others), late June and early July: Levis to Cap Rosier, Gaspé County, thence to Matapedia, Bonaventure County, collecting at numerous stations, especially east of Marsouin River.
M. L. Fernald, C. A. Weatherby and G. Ledyard Stebbins, Jr., July 5: Mt. St. Pierre, Gaspé County.
M. L. Fernald (with daughter and son), September: River St. Lawrence from above Quebec to Ste. Anne de Beaupré and to Bellechasse County (especially Anse St. Vallier).
G. Ledyard Stebbins, Jr., July: Lower St. Lawrence and coast of Gaspé Peninsula.

1934

Walter H. Hodge and John H. Pierce, June and July: Shickshock Mountains of western Matane County (Mt. Blanc, Mt. Bayfield, etc.); Matane River.

Appendix II. Bibliography

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Some American Representatives of Arenaria verna. Rhodora, viii. 31–34 (February, 1906).

Two Variations of Carex glareosa. Rhodora, viii. 45–47 (February, 1906).

The Genus Streptopus in Eastern America. Rhodora, viii. 69–71 (April, 1906).

The Variations of Carex paupercula. Rhodora, viii. 73–77 (April, 1906).

An alpine Variety of Solidago macrophylla. Rhodora, viii. 227, 228 (December, 1906).

The Variations of Primula farinosa in Northeastern America. Rhodora, ix. 15, 16 (January, 1907).

An alpine Rhinanthus of Quebec and New Hampshire. Rhodora, ix. 23–25 (February, 1907).

Note on Cirsium muticum, var. monticola. Rhodora, ix. 28 (February, 1907).

Streptopus oreopolus a possible Hybrid. RHODORA, ix. 106, 107 (June, 1907).

The Soil Preferences of certain Alpine and Subalpine Plants. RHODORA, ix. 149–193—repr. as Contrib. Gray Herb., n. s. no. xxxv. (September, 1907).

Some new Willows of Eastern America. RHODORA, ix. 221–226 (December, 1907).

Lemna minor and Sparganium eurycarpum in Rimouski County, Quebec. RHODORA, x. 95, 96 (May, 1908).

Draba aurea in Rimouski County, Quebec. RHODORA, x. 148 (August, 1908).

Bidens connata and some of its American Allies.—Bidens tripartita L. and Bidens hyperborea Greene. RHODORA, x. 200–203 (November, 1908).

The Variations of Arenaria peploides in America. RHODORA, xi. 109–115 (June, 1909).

A new Variety of Abies balsamea. RHORODA, xi. 201–203 (November, 1909).

A Botanical Expedition to Newfoundland and Southern Labrador. RHODORA, xiii. 109–162, pl. 86–91 (especially portions dealing with Blanc Sablon to Bradore)—repr. as Contrib. Gray Herb., n. s. xl. (July, 1911).

Botanizing on the Gaspé Sea-cliffs. Harvard Alumni Bull. xxxiv. 419–425—repr. 1–8, illustr. (January, 1912).

A Northeastern Variety of Carex Deweyana. RHODORA, xv. 92, 93 (May, 1913).

The North American Representative of Arenaria ciliata. RHODORA, xv. 92, 93 (May, 1913).

Some annual halophytic Asters of the Maritime Provinces. RHODORA, xvi. 57–61, pl. 109 (April, 1914).

Some Willows of boreal America. RHODORA, xvi. 169–179 (October, 1914).

Some new or unrecorded Compositae chiefly of Northeastern America. RHODORA, xvii. 1–20—repr. as Contrib. Gray Herb., n. s. no. xliii. pt. I (January, 1915).

Some Color-forms of American Anemones. RHODORA, xix. 139–141—repr. as Contrib. Gray Herb., n. s., no. l, pt. III. (August, 1917).

Some American Epilobiums of the Section Lysimachion. RHODORA, xx. 29–39 (February, 1918).

American Variations of Epilobium, Section Chamaenerion. RHODORA, xx. 1–10 (January, 1918).

Rosa blanda and its Allies in Northern Maine and adjacent Canada. RHODORA, xx. 90–96 (May, 1918).

The Geographic Affinities of the Vascular Floras of New England, the Maritime Provinces and Newfoundland. Am. Journ. Bot. v. 219–236 (1918).

Two new Myriophyllums and a Species new to the United States. RHODORA, xxi. 120–124 (July, 1919).

Note on "Salivation" of Specimens. RHODORA, xxiii. 111, in footnote (May, 1921).

The Southern Variety of Thelypteris fragrans. RHODORA, xxv. 1–4 (January, 1923).

Empetrum nigrum L., forma purpureum. Rhodora, xxv. 83 (May, 1923).

Contributions from the Gray Herbarium of Harvard University, n. s. no. lxxii.—I. Polystichum mohrioides and some other Subantarctic or Andean Plants in the Northern Hemisphere; II. The Dwarf Antennarias of Northeastern America; III. The Eastern American Representatives of Arnica alpina; IV. Some Senecios of Eastern Quebec and Newfoundland; V. New or recently restudied Plants of Eastern America. Rhodora, xxvi. 89–107 and 114–127, pl. 142–144 (May and June, 1924).

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Myriophyllum magdalenense; A Correction. Rhodora, xxvi. 198 (October, 1924).

Botanical Explorations in Eastern Canada. Harvard Alumni Bull. xxvii. 1046–1051, illustr. (June 11, 1925).

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Axyris amarantoides in eastern America. Rhodora, xxix. 223, 224 (October, 1927).

Geocaulon, a new Genus of the Santalaceae. Rhodora, xxx. 21–24 (February, 1928).

The Eastern American Occurrence of Athyrium alpestre. Rhodora, xxx. 44–49, pl. 161–168 (March, 1928).

Some Eastern American Forms of Senecio. Rhodora, xxx. 224–226 (November, 1928).

Four Grasses of Eastern America. Rhodora, xxxi. 44–49 (March, 1929).

Callitriche stagnalis on the lower St. Lawrence. Rhodora, xxxiv. 39 (February, 1932).

Epilobium ecomosum. Rhodora, xxxiv. 39, 40 (February, 1932).

Another localized Variety of Bidens heterodoxa. Rhodora, xxxiv. 116, 117 (June, 1932).

An Estuarine Variety of Mimulus ringens. Rhodora, xxxiv. 118, 119 (June, 1932).

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The Problem of Conserving rare native Plants. Smithsonian Rep. for 1939: 375–391, 7 plates [including the Gaspé endemic, *Fragaria multicipita*]. (1940).

Fernald, M. L. and S. L. Kelsey. A new Oxytropis from the Gaspé Coast. Rhodora, xxx. 121–124 (June, 1928).

Fernald, M. L. and C. H. Knowlton. Draba incana and its Allies in Northeastern America. Rhodora, vii. 61–67, pl. 50 (April, 1905).

Fernald, M. L. and Harold St. John. Some American Species and Varieties of Bidens in eastern North America. Rhodora, xvii. 20–25—repr. as Contrib. Gray Herb. n. s., no. xliii, pt. II. (January, 1915).

The Occurrence of Botrychium virginianum, var. europaeum in America. Rhodora, xvii. 233, 234 (December, 1915).

Fernald, M. L. and C. A. Weatherby. The Genus Puccinellia in eastern North America. Rhodora, xviii. 1–23, pl. 114–117—repr. as Contrib. Gray Herb. n. s., no. xlvi. (January, 1916).

Some new Plants from the Gaspé Peninsula. Rhodora, xxxiv. 231–240 (December, 1931).

Fernald, M. L. and K. M. Wiegand. Two new Galiums from Northeastern America. Rhodora, xii. 77–79 (April, 1910).

The Representatives of Erigeron acris in Northeastern America. Rhodora, xii. 225–227 (December, 1910).

Epilobium palustre L., var. longirameum. Rhodora, xiii. 188 (August, 1911).

A new Variety of Juncus balticus. Rhodora, xiv. 35, 36 (February, 1912).

Some new Species and Varieties of Poa from Eastern North America. Rhodora, xx. 122–127 (July, 1918).

Leavitt, R. G. On Translocation of Characters in Plants. Rhodora, vii. 13–19 and 21–31 (especially 14 and 15, and 21 and 22, on *Drosera rotundifolia*, var. *comosa*). (January and February, 1905).

Pease, Arthur Stanley. A Day in Gaspé. Rhodora, xxxi. 54–56 (March, 1929).

Pierce, John H. Range Extensions of certain Plants on the Gaspé Peninsula. Rhodora, xxxviii. 273–275 (August, 1936).

Riddle, Lincoln Ware. Notes on some Lichens from the Gaspé Peninsula. Rhodora, xi. 100–102 (May, 1909).

Robinson, B. L. A new Ranunculus fron Northeastern America. Rhodora, vii. 219–222 (November, 1905).

St. John, Harold. A Botanical Exploration of the North Shore of the Gulf of St. Lawrence. Victoria Memorial Mus. Mem. cxxiv. (March, 1922).

Stebbins, G. Ledyard, Jr. Some Interesting Plants from the North Shore of the St. Lawrence. Rhodora, xxxiv. 66, 67 (April, 1932).

Townsend, Charles W. The Old Stumps at Blanc Sablon. Rhodora, xviii. 185–188 (1916).

Weatherby, C. A. A new North American Variety of Cystopteris fragilis. Rhodora, xxviii. 129–131 (July, 1926).

Appendix III. Types and Paratypes

Nearly 200 types or paratypes of new species, varieties or forms (mostly in the Gray Herbarium) were collected on the trips in Quebec by Collins and me or by those working with us or visiting the region through our direct influence, two-thirds of them collected by Collins or with his personal assistance. When his extensive collections of Gaspé mosses are properly studied the number will be greatly extended. In this enumeration the discoveries made in the same region by the energetic workers of the University of Montreal and their collaborators (Brother Marie-Victorin and others), the Institut Agricole d'Oka (Father Louis-Marie and others), and the Canadian government (Dr. Harrison F. Lewis and others) are omitted, as not directly inspired through Collins or those collaborating with him. Their inclusion would greatly extend the list of types, altogether a very remarkable series to come in the 20th century out of one restricted area of temperate and early-settled eastern North America.

Cladonia invisa C. A. Robbins in A. F. Allen in Rhodora, xxxii. 93 (1930). Type from Cap Chat River, Matane County.

Cystopteris fragilis, var. laurentiana Weatherby in Rhodora, xxviii. 129 (1926). Type from Bic, Rimouski County.

Thelypteris fragrans, var. Hookeriana Fernald in Rhodora, xxv. 3 (1923); basis of *Dryopteris fragrans*, var. *Hookeriana* (Fernald) A. R. Prince ex Weatherby in Am. Fern. Journ. xxvi. 62 (1936). Type from River Ste. Anne des Monts, Gaspé County. Apparently identical with *Nephrodium fragrans*, var. *remotiusculum* Komarov in Fedde, Rep. Spec. Nov. ix. 394 (1911); basis of Dryopteris fragrans, var. remotiuscula Komarov, Fl. U. R. S. S. i. 38 (1934).

Athyrium alpestre, var. gaspense Fernald in Rhodora, xxx. 48, pl. 168. Type from Mt. Dunraven, Tabletop Mountain, Gaspé County.

Athyrium angustum, var. laurentianum Butters in Rhodora, xix. 194 (1917). Type from Tabletop Mountain, Gaspé County.

Athyrium angustum, forma confertum Butters in Rhodora, xix. 195 (1917). Type from Tabletop Mountain, Gaspé County.

Botrychium virginianum, var. laurentianum Butters in Rhodora, xix. 209 (1917). Type from Bic, Rimouski County.

Lycopodium annotinum, var. acrifolium Fernald in Rhodora, xvii. 124 (1915). Paratype from Magdalen Islands.

Equisetum palustre, var. nigridens St. John, Victoria Memorial Mus. Mem. cxxiv. 42 (1922). Type from Romaine, Saguenay County.

Abies balsamea, var. phanerolepis Fernald in Rhodora, xi. 203 (1909). Type from Percé, Gaspé County.

Juniperus communis, var. megistocarpa Fernald & St. John in Proc. Bost. Soc. Nat. Hist. xxxvi. 58 (1921). Paratypes from Magdalen Islands.

Potamogeton moniliformis St. John in Rhodora, xviii. 130 (1916). Type from Blanc Sablon River, Saguenay County. Later identified by St. John with P. vaginatus Turcz. in Bull. Soc. Nat. Moscou, xi. 102 (1838), xxvii. 65 (1854) and Fl. Baical-Dahur. ii. 162 (1856).

Potamogeton pusillus, var. colpophilus Fernald in Mem. Amer. Acad. xv. 90, pl. 20, figs. *d* and *10*, and pl. 35, fig. 5 (1932); basis of P. Berchtoldi, var. colpophilus Fernald in Rhodora, xlii. 246 (1940). Type from mouth of Dartmouth River, Gaspé County.

Potamogeton microstachys, var. subellipticus Fernald in Rhodora, xxxii. 82 (1930); basis of P. tenuifolius, var. subellipticus Fernald in Rhodora, xxxiii. 211 (1931). Type from Magdalen Islands.

Scheuchzeria palustris, var. americana Fernald in Rhodora, xxiii. 178 (1923). Paratype from Tabletop Mountain, Gaspé County.

Sagittaria cuneata, forma hemicycla Fernald in Rhodora, xxxviii. 74 (1936). Type from St. Augustin, Portneuf County.

Bromus Dudleyi Fernald in Rhodora, xxxii. 63, pl. 196, figs. 1–3 (1930). Paratypes from Gaspé and Bonaventure Counties, etc.

Puccinellia coarctata Fernald & Weatherby in Rhodora, xviii. 13, pl. 115, figs. 28–32 (1916). Paratypes from Brest and Romaine, Saguenay County.

Puccinellia laurentiana Fernald & Weatherby in Rhodora, xviii. 14, pl. 115, figs. 33–38 (1916). Type from Carleton, Bonaventure County.

Puccinellia macra Fernald & Weatherby in Rhodora, xviii. 15, pl. 115, figs. 39–43 (1916). Type from Bonaventure Island, Gaspé County.

Puccinellia lucida Fernald & Weatherby in Rhodora, xviii. 16, pl. 116, figs. 54–58 (1916). Type from Cacouna, Temiscouata County.

Poa Fernaldiana Nannfeld in Symb. Bot. Upsal. v. 50, figs. (1935). Paratype from Tabletop Mountain, Gaspé County.

Poa gaspensis Fernald in Rhodora, xxxi. 46 (1929). Type from River Ste. Anne des Monts, Gaspé County.

Poa saltuensis Fernald & Wiegand in Rhodora, xx. 122 (1918). Type from River Ste. Anne des Monts, Gaspé County.

Poa saltuensis, var. microlepis Fernald & Wiegand in Rhodora, xx. 124 (1918). Paratypes from Gaspé and Bonaventure Counties.

Catabrosa aquatica, var. laurentiana Fernald in Rhodora, xxxv. 137, pl. 242, figs. 3 and 4 (1933). Type from Capuchins, Matane County.

Avena striata, forma albicans Fernald in Rhodora, vii. 244 (1905); basis of *Melica striata*, forma *albicans* Fernald in Rhodora, x. 47 (1908), and of Schizachne purpurascens (Torr.) Swallen, forma **albicans** (Fernald), comb. nov. Type from Mt. Albert, Gaspé County.

Agropyron caninum, var. tenerum, forma Fernaldii Pease & Moore in Rhodora, xii. 73 (1910); basis of A. trachycaulum, var. Fernaldii (Pease & Moore) Malte in Ann. Rep., 1930, Nat. Mus. Can. 46 (1932). Paratype from Percé, Gaspé County.

Agrostis geminata, forma exaristata Fernald in Rhodora, xxxv. 211 (1933). Type from North Fork of Madeleine River, Gaspé County.

Calamagrostis lapponica, var. brevipilis Stebbins in Rhodora, xxxii. 56 (1930). Type from Blanc Sablon, Saguenay County.

Trisetum spicatum, var. pilosiglume Fernald in Rhodora, xviii. 195 (1916). Paratypes from Saguenay, Gaspé and Rimouski Counties.

Zizania aquatica, var. brevis Fassett in Rhodora, xxvi. 157 (1924). Type from Levis, Levis County.

Eleocharis uniglumis, var. halophila Fernald & Brackett in Rhodora, xxxi. 72, pl. 183 (1929); basis of E. halophila Fernald & Brackett in Rhodora, xxxvii. 395, pl. 387, figs. 12–14 (1935). Type from mouth of Bonaventure River, Bonaventure County.

Eriophorum spissum Fernald in Rhodora, xxvii. 209 (1925). Paratypes from Saguenay and Gaspé Counties.

Eriophorum tenellum, var. monticola Fernald in Rhodora, x. 47 (1908). Type from Tabletop Mt., Gaspé County.

Carex glareosa, var. amphigena Fernald in Rhodora, viii. 47 (1906); basis of C. bipartita, var. amphigena (Fernald) Polunin, Bot. Can. E. Arctic. pt. i. 115 (1940). Type from Escuminac, Bonaventure County.

Carex Deweyana, var. collectanea Fernald in Rhodora, xv. 93 (1913). Type from Grand Cascapedia River, Bonaventure County.

Carex Garberi, var. bifaria Fernald in Rhodora, xxxvii. 255, pl. 360, figs. 11 and 12 (1935). Type from River Ste. Anne des Monts, Gaspé County.

Carex clivicola Fernald & Weatherby in Rhodora, xxxiii. 233 (1931). Type from Mt. St. Pierre, Gaspé County.

Carex laxiflora, var. leptonervia Fernald in Rhodora, viii. 184 (1906); basis of C. leptonervia Fernald in Rhodora, xvi. 214 (1914). Paratype from Mt. Albert, Gaspé County.

Carex ormostachya Wiegand in Rhodora, xxiv. 196 (1922). Paratype from Bic, Rimouski County.

Carex flava, var. gaspensis Fernald in Rhodora, viii. 200 (1906). Type from Bonaventure River, Bonaventure County.

Carex vesicaria, var. laurentiana Fernald in Rhodora, xxxv. 232 (1933). Paratypes from Saguenay County and Magdalen Islands.

Carex rostrata × saxatilis, var. miliaris, n. hybr., Fernald in Rhodora, x. 48 (1908). Type from Tabletop Mt., Gaspé County.

Juncus bufonius, var. halophilus Buchenau & Fernald in Rhodora, vi. 39 (1904). Type from Rivière du Loup, Temiscouata County.

Juncus balticus, var. stenocarpus Buchenau & Fernald in Buchenau in Engler, Pflanzenr. iv[36]. 141 (1906). Type from mouth of Bonaventure River, Bonaventure County.

Juncus balticus, var. melanogenus Fernald & Wiegand in Rhodora, xiv. 35 (1912). Type from Bradore, Saguenay County.

Allium Schoenoprasum, var. laurentianum Fernald in Rhodora, xxviii. 167 (1926). Paratype from Matapedia, Bonaventure County.

Streptopus oreopolus Fernald in Rhodora, viii. 70 (1906); basis of S. amplexifolius, var. oreopolus (Fernald) Fassett in Rhodora, xxxvii. 99 (1935). Type from Mt. Albert, Gaspé County.

Habenaria obtusata, var. collectanea Fernald in Rhodora, xxviii. 175 (1926). Paratypes from Blanc Sablon, Goynish and Mingan, Saguenay County.

Salix vestita, var. psilophylla Fernald & St. John in St. John, Victoria Memorial Mus. Mem. cxxiv. 44 (1922). Type from Eskimo Island, Mingan, Saguenay County.

Salix anglorum, var. kophophylla Schneider in Bot. Gaz. lxvi. 130 (1918). Paratypes from Mt. Albert, Gaspé County.

Salix anglorum, var. araioclada Schneider in Bot. Gaz. lxvi. 133 (1918). Type from Mt. Albert, Gaspé County.

Salix anglorum, var. antiplasta Schneider in Bot. Gaz. lxvi. 134 (1918). Type from Mt. Albert, Gaspé County.

Salix chlorolepis Fernald in Rhodora, vii. 186 (1905). Type from Mt. Albert, Gaspé County.

Salix chlorolepis, var. antimima Schneider in Bot. Gaz. lxvi. 339 (1918); basis of S. brachycarpa, var. antimima (Schneider) Raup in in Rhodora, xxxiii. 243 (1931). Type from Mt. Albert, Gaspé County.

Salix cordifolia, var. intonsa Fernald in Rhodora, xxviii. 185 (1926). Paratypes from Blanc Sablon, Saguenay County and from Tabletop Mountain, Gaspé County.

Salix cordifolia, var. eucycla Fernald in Rhodora, xxviii. 187 (1926). Paratypes from Archipel Ouapitagone, Saguenay County.

Salix cordifolia, var. tonsa Fernald in Rhodora, xxviii. 187 (1926). Paratype from Mt. Mattaouisse, Matane County.

Salix fuscescens, var. hebecarpa Fernald in Rhodora, ix. 224 (1907); basis of S. hebecarpa Fernald in Rhodora, xxvi. 123 (1924). Type from Mt. Albert, Gaspé County.

Salix rostrata, var. capreifolia Fernald in Rhodora, xvi. 177 (1914); basis of S. Bebbiana, var. capreifolia Fernald in Rhodora, xxvi. 123 (1924). Type from Tourelle, Gaspé County.

Salix rostrata, var. luxurians Fernald in Rhodora, ix. 223 (1907); basis of S. Bebbiana, var. luxurians Fernald in Rhodora, xxvi. 122 (1924). Type from Bic, Rimouski County.

Salix laurentiana Fernald in Rhodora, ix. 221 (1907). Type from Les Méchins, Matane County (formerly Gaspé County).

Salix paraleuca Fernald in Rhodora, xvi. 175 (1914). Type from Grand River, Gaspé County.

SALIX STENOCARPA Fernald in RHODORA, xvi. 176 (1914). TYPE from Matapedia, Bonaventure County.

SALIX OBTUSATA Fernald in RHODORA, ix. 223 (1907). TYPE from River Ste. Anne des Monts, Gaspé County.

SALIX GLAUCOPHYLLOIDES Fernald in RHODORA, xvi. 173 (1914). PARATYPES from Gaspé and Bonaventure Counties.

BETULA ALBA, var. ELOBATA Fernald in RHODORA, xv. 169 (1913): basis of B. PAPYRIFERA, var. ELOBATA (Fernald) Sargent in Journ. Arn. Arb. i. 63 (1919). TYPE from Mt. Albert, Gaspé County.

BETULA PUMILA, var. RENIFOLIA Fernald in RHODORA, xxviii. 190 (1926). TYPE from Mutton Bay, Saguenay County.

COMANDRA RICHARDSIANA Fernald in RHODORA, vii. 48 (1905). TYPE from Grand River, Gaspé County.

POLYGONUM ACHOREUM Blake in RHODORA, xix. 232 (1917). PARATYPE from York, Gaspé County.

POLYGONUM HYDROPIPER L., var. PROJECTUM Stanford in RHODORA, xxix. 86 (1927). PARATYPES from Magdalen Islands, etc.

ARENARIA CYLINDROCARPA Fernald in RHODORA, xvi. 43 (1914). TYPE from Mt. Albert, Gaspé County. Better referred to A. HUMIFUSA Wahlenb. Fl. Lapp. 129 (1812).

ARENARIA VERNA, var. PROPINQUA, forma EPILIS Fernald in RHODORA, viii. 32 (1906); basis of *A. verna*, var. *pubescens*, forma *epilis* Fernald in RHODORA, xxi. 22 (1919) and of A. RUBELLA, forma EPILIS (Fernald) Polunin in RHODORA, xli. 39 (1939). TYPE from Percé, Gaspé County.

ARENARIA LITOREA Fernald in RHODORA, viii. 33 (1906). TYPE from Carleton, Bonaventure County. Apparently identical with A. DAWSONENSIS Britton in Bull. N. Y. Bot. Gard. ii. 169 (1901).

ARENARIA MARCESCENS Fernald in RHODORA, xxi. 15 (1919). TYPE from Mt. Albert, Gaspé County.

STELLARIA CALYCANTHA, var. LAURENTIANA Fernald in RHODORA, xlii. 254 (1940). TYPE from Christie, Gaspé County.

RANUNCULUS SUBRIGIDUS W. B. Drew in RHODORA, xxxviii. 39, pl. 406, figs. 1, 4 and 10 (1936). TYPE from York River, Gaspé County.

RANUNCULUS PURSHII, var. PROLIFICUS Fernald in RHODORA, xix. 135 (1917); basis of R. GMELINI, var. PROLIFICUS (Fernald) Hara in RHODORA, xli. 386 (1939). TYPE from Magdalen Islands.

RANUNCULUS PYGMAEUS, var. PETIOLULATUS Fernald in RHODORA, xix. 137 (1917). TYPE from Mt. Albert, Gaspé County. According to Dr. M. P. Porsild in Arbejder fra Danske Arkt. Sta. Disko, no. 13: 42–44 (1930), this is the rare plant of Greenland, R. PYGMAEUS, var. LANGEANA Nathorst in Öfv. K. Vet. Akad. Förh., 1884, no. 1: 46 (1884).

RANUNCULUS ALLENII Robinson in RHODORA, vii. 220 (1905). TYPE from Mt. Albert, Gaspé County.

RANUNCULUS ABORTIVUS, var. ACROLASIUS Fernald in RHODORA, xl. 418, pl. 519, figs. 1 and 2 (1938). PARATYPES from Saguenay, Gaspé and Matane Counties.

ANEMONE MULTIFIDA, forma POLYSEPALA Fernald in RHODORA, xix. 141 (1917). TYPE from Grand River, Gaspé County.

ANEMONE MULTIFIDA, var. RICHARDSIANA Fernald in RHODORA, xix. 141 (1917). TYPE from Grand River, Gaspé County.

ANEMONE MULTIFIDA, var. RICHARDSIANA, forma LEUCANTHA Fernald in RHODORA, xix. 141 (1917). TYPE from Grand River, Gaspé County.

Anemone riparia, forma rhodantha Fernald in Rhodora, xix. 139 (1917). Type from Grand River, Gaspé County.

Anemone riparia, forma inconspicua Fernald in Rhodora, xix. 140 (1917). Type from Percé, Gaspé County.

Thalictrum polygamum, var. hebecarpum Fernald in Rhodora, x. 49 (1908). Type from Rivière du Loup, Temiscouata County.

Draba Peasei Fernald in Rhodora, xxxvi. 298, pl. 295, figs. 4–7 (1934). Type from Cape Rosier, Gaspé County.

Draba Allenii Fernald in Rhodora, xxxvi. 289, pl. 292 (1934). Type from Fernald Pass, Mt. Mattaouisse, Matane County.

Draba norvegica, var. pleiophylla Fernald in Rhodora, xxxvi. 324, pl. 302 (1934). Paratypes from Blanc Sablon, Saguenay County.

Draba clivicola Fernald in Rhodora, xxxvi. 326, pl. 303 (1934). Type from Big Chimney, Mt. Mattaouisse, Matane County.

Draba incana, var. conica O. E. Schulz in Engler, Pflanzenr. iv^{105}. 285 (1927). Type from Percé, Gaspé County.

Draba arabisans, var. orthocarpa Fernald & Knowlton in Rhodora, vii. 66, pl. 60, figs. 10 and 11 (1905); basis of D. glabella, var. orthocarpa (Fernald & Knowlton) Fernald in Rhodora, xxxvi. 336, pl. 310 (1934). Type from Bic, Rimouski County.

Draba megasperma Fernald & Knowlton in Rhodora, vii. 65, pl. 60, figs. 6–8 (1905); basis of D. glabella, var. megasperma (Fernald & Knowlton) Fernald in Rhodora, xxxvi. pl. 311 and 312 (1934). Type from Paspebiac, Bonaventure County.

Draba pycnosperma Fernald & Knowlton in Rhodora, vii. 67, pl. 60, figs. 13–15 (1905). Type from Percé, Gaspé County.

Arabis pycnocarpa Hopkins in Rhodora, xxxix. 113, pl. 458, figs. 1 and 2 (1937); basis of A. hirsuta, var. pycnocarpa (Hopkins) Rollins in Rhodora, xliii. 318 (1941). Type from Nouvelle, Bonaventure County.

Arabis pycnocarpa, var. reducta Hopkins in Rhodora, xxxix. 117 (1937). Type from Carleton, Bonaventure County.

Arabis divaricarpa, var. stenocarpa Hopkins in Rhodora, xxxix. 133 (1937). Type from Bic, Rimouski County.

Arabis Collinsii Fernald in Rhodora, vii. 32 (1905); basis of A. Holboellii, var. Collinsii (Fernald) Rollins in Rhodora, xliii. 445 (1941). Type from Bic, Rimouski County.

Drosera rotundifolia, var. comosa Fernald in Rhodora, vii. 9 (1925). Type from Grand River, Gaspé County.

Saxifraga cernua, var. latibracteata Fernald & Weatherby in Rhodora, xxxiii. 234 (1931). Type from Tabletop Mountain, Gaspé County.

Saxifraga gaspensis Fernald in Rhodora, xix. 141 (1917). Type from Tabletop Mountain, Gaspé County.

Ribes oxyacanthoides, var. calcicola Fernald in Rhodora, vii. 155 (1905); basis of R. hirtellum, var. calcicola Fernald in Rhodora, xiii. 76 (1911). Type from mouth of Bonaventure River, Bonaventure County.

Amelanchier sanguinea, var. gaspensis Wiegand in Rhodora, xiv. 139 (1912); basis of A. gaspensis (Wieg.) Fernald & Weatherby in Rhodora, xxxiii. 235 (1931). Type from Bonaventure River, Bonaventure County.

Amelanchier Fernaldii Wiegand in Rhodora, xxii. 149 (1920). Type from Magdalen Islands.

Rubus idaeus, var. strigosus, forma tonsus Fernald, in Rhodora, xxi. 96 (1919). Type from Mt. Albert, Gaspé County.

Rubus idaeus, var. eucyclus Fernald & Weatherby in Rhodora xxxiii. 237 (1931). Type from Ruisseau a Rebour, Gaspé County.

Fragaria multicipita Fernald in Rhodora, x. 49 (1908). Type from River Ste. Anne des Monts, Gaspé County.

Geum pulchrum Fernald in Rhodora, viii. 11 (1906). Type from Bic, Rimouski County.

Rosa Williamsii Fernald in Rhodora, xx. 95 (1918). Type from Bic, Rimouski County.

Astragalus scrupulicola Fernald & Weatherby in Rhodora, xxxiii. 238, fig. 1 (1931). Type from Mt. St. Pierre, Gaspé County.

Atelophragma Fernaldi Rydberg in Bull. Torr. Bot. Cl. lv. 126 (1928); basis of Astragalus Fernaldi (Rydb.) H. F. Lewis in Can. Field Nat. xlvi. 36 (1932). Type from Blanc Sablon, Saguenay County.

Astragalus gaspensis Rousseau in Contrib. Lab. Bot. Univ. Montréal, no. 24: 51, figs. 15 and 16 (1933); basis of A. frigidus, var. gaspensis (Rousseau) Fernald in Rhodora, xxxix. 313, pl. 472, figs. 9–13 (1937). Topotype from Little Cascapedia River, Bonaventure County.

Oxytropis gaspensis Fernald & Kelsey in Rhodora, xxx. 123 (1928). Type from Mt. St. Pierre, Gaspé County.

Callitriche anceps Fernald in Rhodora, x. 51 (1908). Type from Lac des Americaines, Tabletop Mountain, Gaspé County.

Empetrum atropurpureum Fernald & Wiegand in Rhodora, xv. 214 (1913). Paratype from Magdalen Islands.

Empetrum Eamesii Fernald & Wiegand in Rhodora, xv. 215 (1913). Paratype from Blanc Sablon, Saguenay County.

Viola cucullata, var. microtitis Brainerd in Rhodora, xv. 112 (1913). Paratype from Magdalen Islands.

Viola adunca, var. glabra Brainerd in Rhodora, xv. 109 (1913). Type from Carleton, Bonaventure County.

Epilobium palustre, var. longirameum Fernald & Wiegand in Rhodora, xiii. 188 (1911). Type from Blanc Sablon, Saguenay County.

Epilobium densum, var. nesophilum Fernald in Rhodora, xx. 29 (1918); basis of E. nesophilum Fernald in Rhodora, xxvii. 32 (1925). Type from Magdalen Islands.

Epilobium glandulosum, var. cardiophyllum Fernald in Rhodora, xx. 35 (1918). Type from Low's Trail, Gaspé County.

Epilobium glandulosum, var. brionense Fernald in Rhodora, xx. 35 (1918). Type from Magdalen Islands.

Epilobium glandulosum, var. ecomosum Fassett in Rhodora, xxvi. 48 (1924); basis of E. ecomosum (Fassett) Fernald in Rhodora, xxxiv. 39 (1932). Type from St. Vallier, Bellechasse County.

Myriophyllum exalbescens Fernald in Rhodora, xxi. 120 (1919). Type from York River, Gaspé County.

Myriophyllum magdalenense Fernald in Rhodora, xxi. 123 (1919) and xxvi. 198 (1924). Type from Magdalen Islands.

Sanicula marilandica, var. borealis Fernald in Rhodora, xxviii. 220 (1926). Paratypes from Gaspé and Bonaventure Counties.

Angelica laurentiana Fernald in Rhodora, xxviii. 222 (1926). Paratype from Boishébert, Saguenay County.

Cornus canadensis, forma rosea Fernald in Rhodora, xliii. 156 (1941). Type from Mt. Mattaouisse, Matane County. Apparently inseparable from *Chamaepericlymenum canadense*, forma *purpurascens* Miyabe & Tatewaki in Trans. Sapporo Nat. Hist. Soc. xv. 43 (1937); basis of Cornus canadensis, forma purpurascens (Miyabe & Tatewaki) Hara in Rhodora, xliv. 20 (1942).

Arctostaphylos Uva-ursi, var. coactilis Fernald & Macbride in Rhodora, xvi. 212 (1914). Paratype from Magdalen Islands.

Vaccinium nubigenum Fernald in Rhodora, x. 53 (1908). Type from Mt. Albert, Gaspé County.

Primula farinosa, var. macropoda Fernald in Rhodora, ix. 16 (1907); basis of P. laurentiana Fernald in Rhodora, xxx. 68, pl. 169 (1928). Type from Bic, Rimouski County.

Androsace septentrionalis, var. robusta St. John, Victoria Memorial Mus. Mem. cxxiv. 48 (1922). Type from Ile Ste. Geneviève, Mingan, Saguenay County.

Statice labradorica, var. submutica Blake in Rhodora, xix. 7 (1917). Type from Mt. Albert, Gaspé County.

Lomatogonium rotatum, forma ovalifolium Fernald in Rhodora, xxi. 197 (1919). Type from Magdalen Islands.

Cynoglossum boreale Fernald in Rhodora, vii. 250 (1905). Type from Little Cascapedia River, Bonaventure County.

Scutellaria lateriflora forma rhodantha Fernald in Rhodora, xxiii. 86 (1921). Type from Dartmouth River, Gaspé County.

Prunella vulgaris, var. lanceolata, forma candida Fernald in Rhodora, xv. 184 (1913). Paratype from River Ste. Anne des Monts, Gaspé County.

Mimulus ringens, var. colpophilus Fernald in Rhodora, xxxiv. 119 (1932). Type from mouth of Chaudière River, Levis County.

Gratiola lutea, var. glaberrima Fernald in Rhodora, xxxiv. 149 (1932). Type from Anse St. Vallier, Bellechasse County.

Euphrasia Oakesii, forma lilacina Fernald & Wiegand in Rhodora, xvii. 185 (1915). Type from Blanc Sablon, Saguenay County.

Euphrasia purpurea, forma candida Fernald & Wiegand in Rhodora, xvii. 187 (1915). Type from Magdalen Island.

Euphrasia purpurea, var. Randii, forma albiflora Fernald & Wiegand in Rhodora, xvii. 188 (1915). Paratype from Magdalen Islands.

Euphrasia disjuncta Fernald & Wiegand in Rhodora, xvii. 190 (1915). Paratypes from eastern Saguenay County.

Rhinanthus oblongifolius Fernald in Rhodora, ix. 24 (1907). Type from Tabletop Mt., Gaspé County.

Plantago juncoides, var. laurentiana Fernald in Rhodora, xxvii. 102, pl. 150, fig. 5 (1925). Paratype from Magdalen Islands.

Plantago oliganthos, var. fallax Fernald in Rhodora, xxvii. 103, pl. 150, fig. 7 (1925). Paratypes from Carleton, Bonaventure County, etc.

Galium brevipes Fernald & Wiegand in Rhodora, xii. 78 (1910). Type from Grand River, Gaspé County.

Galium trifidum, var. halophilum Fernald & Wiegand in Rhodora, xii. 78 (1910). Type from mouth of Bonaventure River, Bonaventure County.

Sambucus pubens, forma calva Fernald in Rhodora, xxxv. 310 (1933). Type from Fernald Pass, between Mts. Mattaouisse, Fortin and Logan, Matane County.

Eupatorium perfoliatum, var. colpophilum Fernald & Griscom in Rhodora, xxxvii. 182 (1935). Type from Berthier, Montmagny County.

Solidago hispida, var. disjuncta Fernald in Rhodora, xvii. 2 (1915). Paratype from Tabletop Mountain, Gaspé County.

Solidago chlorolepis Fernald in Rhodora, xvii. 3 (1915). Type from Mt. Albert, Gaspé County.

Solidago multiradiata, var. parviceps Fernald in Rhodora, xxxviii. 202, pl. 417, fig. 2 (1936). Type from near Cape Rosier, Gaspé County.

Solidago mensalis Fernald in Rhodora, xvii. 4 (1915). Type from Tabletop Mountain, Gaspé County.

Solidago chrysolepis Fernald in Ottawa Nat. xix. 168 (1905). Type from River Ste. Anne des Monts, Gaspé County.

Solidago lepida, var. molina Fernald in Rhodora, xvii. 9 (1915). Type from Percé, Gaspé County.

Solidago lepida, var. fallax Fernald in Rhodora, xvii. 9 (1915). Paratypes from Gaspé and Bonaventure Counties.

Solidago graminifolia, var. septentrionalis Fernald in Rhodora, xvii. 12 (1915). Paratype from St. John (Douglastown) River, Gaspé County.

Aster foliaceus, var. arcuans Fernald in Rhodora, xvii. 14 (1915). Type from St. John (Douglastown) River, Gaspé County.

Aster foliaceus, var. crenifolius Fernald in Rhodora, xvii. 15 (1915). Type from Grand River, Gaspé County.

Aster foliaceus, var. subpetiolatus Fernald in Rhodora, xvii. 15 (1915). Type from Grand River, Gaspé County.

Aster puniceus, var. perlongus Fernald in Rhodora, xvii. 17 (1915). Type from Tabletop Mountain, Gaspé County.

Aster puniceus, var. firmus, forma rufescens Fassett in Rhodora, xxvii. 187 (1925). Type from Cap-Rouge, Quebec County.

Aster laurentianus Fernald in Rhodora, xvi. 59, pl. 109, figs. 1–3 (1914). Paratype from Magdalen Islands.

Aster laurentianus, var. magdalenensis Fernald in Rhodora, xvi. 59, pl. 119, fig. 4 (1914). Type from Magdalen Islands.

Erigeron ramosus, var. septentrionalis Fernald & Wiegand in Rhodora, xv. 61 (1913). Paratype from Douglastown, Gaspé County.

Erigeron acris, var. oligocephalus Fernald & Wiegand in Rhodora, xii. 226 (1910); basis of E. elatus, var. oligocephalus (Fernald & Wiegand) Fernald in Rhodora, xl. 344, pl. 505, figs. 1 and 2 (1938). Type from Blanc Sablon, Saguenay County.

Antennaria vexillifera Fernald in Rhodora, xxvi. 99, pl. 142, fig. 4 (1924). Type from Tableland between Mts. Mattaouisse and Collins, Matane County.

Antennaria Peasei Fernald in Rhodora, xxvi. 101, pl. 142, fig. 11 (1924). Type from Mt. Logan, Matane County.

Antennaria subviscosa Fernald in Rhodora, xvi. 131 (1914). Type from Bic, Rimouski County.

Antennaria spathulata, var. continentis Fernald & St. John in St. John, Victoria Memorial Mus. Mem. cxxiv. 55 (1922). Type from Natishkwan, Saguenay County.

Antennaria appendiculata Fernald in Rhodora, xxiii. 295 (1922). Type from the Grand River, Gaspé County.

Antennaria glabrifolia Fernald in St. John, Victoria Memorial Mus. Mem. cxxiv. 55 (1922). Type from Natishkwan, Saguenay County.

Antennaria neodioica, var. gaspensis Fernald in Ottawa Nat. xix. 156 (1905); basis of A. gaspensis Fernald in Rhodora, xxxv. 341, pl. 268, figs. at right (1933). Type from Percé, Gaspé County.

Antennaria neodioica, var. interjecta Fernald in Rhodora, xxxv. 342 (1933). Type from Bic, Rimouski County.

Bidens cernua, var. oligodonta Fernald & St. John in Rhodora, xvii. 25 (1915). Type from Magdalen Islands.

Bidens hyperborea, var. gaspensis Fernald in Rhodora, xx. 150 (1918). Type from mouth of Dartmouth River, Gaspé County.

Bidens hyperborea, var. Svensoni Fassett in Rhodora, xxvii. 170 (1925). Type from Rimouski, Rimouski County.

Bidens hyperborea, var. laurentiana Fassett in Rhodora, xxvii. 169 (1925). Type from Cap-Rouge, Quebec County.

Bidens heterodoxa, var. orthodoxa Fernald & St. John in Rhodora, xvii. 24 (1915). Type from Magdalen Islands.

Bidens heterodoxa, var. atheistica Fernald in Rhodora, xxxiv. 116 (1932); basis of B. infirma Fernald in Rhodora, xl. 351, pl. 507, figs. 1–3 (1938). Type from Anse St. Vallier, Bellechasse County.

Bidens frondosa, var. stenodonta Fernald & St. John in Rhodora, xvii. 22 (1915). Paratype from Magdalen Islands.

Senecio pseudaureus, forma ecoronatus Fernald in Rhodora, xxx. 225 (1928). Type from North Fork of Madeleine River, Gaspé County.

Senecio aureus × Balsamitae, n. hybr. Greenman in Rhodora, x. 69 (1908). Type from Bonaventure River, Bonaventure County.

Senecio gaspensis Greenm. in Ann. Mo. Bot. Gard. iii. 138 (1916). Type from Percé, Gaspé County.

Senecio Balsamitae, var. firmifolius Greenm. in Rhodora, vii. 244 (1905); basis of S. pauperculus, var. firmifolius Greenm. in Ann. Mo. Bot. Gard. iii. 166 (1916). Type from Percé, Gaspé County.

Arnica chionopappa Fernald in Rhodora, vii. 148 (1905). Type from Grand River, Gaspé County.

Arnica gaspensis Fernald in Rhodora, vii. 149 (1905). Type from Cap Tourelle, Gaspé County.

Arnica Griscomi Fernald in Rhodora, xxvi. 105, pl. 143, fig. 7 (1924). Type from Mt. Mattaouisse, Gaspé County. Seems specifically inseparable from A. louiseana Farr in Ottawa Nat. xx. 109 (1906).

Cnicus muticus, var. monticola Fernald in Ottawa Nat. xix. 166 (1905); basis of Cirsium muticum, var. monticola Fernald in Rhodora, ix. 28 (1907). Type from Mt. Albert, Gaspé County.

Agoseris gaspensis Fernald in Rhodora, xxvi. 125 (1924). Type from Tabletop Mountain, Gaspé County.

Taraxacum Longii Fernald in Rhodora, xxxv. 379, pl. 273, figs. 1–4 (1933). Paratype from Grand River, Gaspé County.

Taraxacum ambigens Fernald in Rhodora, xxxv. 376, pl. 271, figs. 5–8 (1933). Paratypes from Blanc Sablon, Ste. Anne des Monts River and Grand Cascapedia River.

Taraxacum ambigens, var. fultior Fernald in Rhodora, xxxv. 376, pl. 271, fig. 9 (1933). Paratypes from Fernald Basin, Matane County.

Hieracium canadense, var. hirtirameum Fernald in Rhodora, xvii. 19 (1915). Paratypes from Bonaventure County.
Hieracium scabrum, var. tonsum Fernald & St. John in Rhodora, xvi. 182 (1914). Type from Magdalen Islands.

WILLDENOW'S SPECIES PLANTARUM AND MICHAUX'S FLORA BOREALI-AMERICANA: DATES OF PUBLICATION

Bernice G. Schubert

In 1891 Otto Kuntze published in the Revisio Generum Plantarum[1] a list of dates of publication for the several parts of Willdenow's edition of Linnaeus's Species Plantarum. Kuntze obtained the dates from Kayser's Bücherlexicon (1835) and with them established a date of publication later than that given on the title page for at least one part of each volume. In reference to parts 3 and 4 of Willdenow's volume III, which came into competition with Michaux's Flora Boreali-Americana, Kuntze said that he was not able to discover whether III³ (1803) appeared before or after Michaux's Flora (although he gave 1804 as the proper date), but that he gave Michaux precedence because the omission of a date in Willdenow occurred maliciously[2]. The dates offered by Kuntz were subsequently adopted in the international Rules of Botanical Nomenclature.[3]

In an attempt to solve one of the many long-standing problems which have arisen because of the conflict of dates between Willdenow's volume III³ and Michaux's Flora I have found information concerning the dates of both works which seems worthy of notice.

In the Intelligenzblatt der Allgemeine Literatur-Zeitung (published in Halle and Leipzig), for November 4, 1797 (number 137) volume I part 1 is announced by the Berlin publisher Nauk, in the following manner:

> *In der Naukschen Buchhandlung zu Berlin sind folgende Bücher erschienen:*

[1] O. Kuntze, Rev. Gen. i. cxxiv (1891).
[2] " . . . betr. III³ 1803 konnte ich nicht ermitteln, ob es vor oder nach Michaux' flora erschien und gebe ich Michaux den Vorzug, weil die Unterlassung der Datumangaben bei Willdenow freventlich geschah."
[3] Int. Rules of Botanical Nomencl. Art. 45 (1935).

[entry no.] 4) Linée species plantarum exhib. plantas rite cognitas ad gen. relatas cum differentiis, nomin. trivial. synon. selectis, locis natal. sec. syst. sexuale digestas. Tom. I. edit. quarta post. Reichard. quinta cura Carl. Lud. Willdenow. Vol. I. p. I. 8 maj. auf. engl. Papr. 2 Rthlr. auf ord. Druckpr. 1 Rthlr. 14 gr.

Therefore 1797, as indicated on the title-page, and not 1798 as stated by Kuntze, is the correct date for volume I part 1.

In the Intelligenzblatt of the same journal for February 1, 1800 (number 16) volumes I and II are listed by Nauk:

Noch sind bey mir folgende Bücher verlegt:
[entry no.] 7) Linne, Carolia., species plantarum cura Willdenow. T. I und II. gr. 8 7 Rthlr. 18 gr.

Thus the date 1799 on the title page of volume II is undoubtedly correct.

In the Intelligenzblatt for January 7, 1801 (number 3) volume III is announced as having been published in 1800, as dated on the title page.

Bey *Nauck* in Berlin ist erschienen, und in jeder guten Buchhandlung zu bekommen:
[entry no. 2] Caroli a Linné Species plantarum cura Willdenow. Tom. III. 8 maj. 1800 2 Rthlr. 8 gr.

The entry which follows here, indicates that the notice above is for part 1 of volume III.

In the Intelligenzblatt for November 10, 1802 (number 208) may be found:

In meiner Buchhandlung ist so eben fertig geworden und zu bekommen:
[entry no.] 2) Linné Species plantarum cura Willdenow. Tom. III p. IIda. 8 maj. 1802. I Rthlr. 16 gr.

After 1802 Nauk seems to have submitted no further lists of his newly published books. That he continued to publish is certain however, because in numerous later reviews he is cited as publisher[4].

Although 1803 is the critical year and no notice of volume III part 3 of Willdenow's work could be found in the Allgemeine

[4] For review of volumes I, II and III see Allgem. Lit.-Zeit. no. 304, 353–359 (Nov. 21, 1805). For review of volume IV see Ergänzungsblatt zur Allgem. Lit.-Zeit. no. 9, 65–71 (Jan. 20, 1807). For review of volume V see op. cit., no. 37, 289–294 (April 3, 1810) and no. 38, 297–301 (April 5, 1810).

Literatur-Zeitung, the following entry from the publishing house of Levrault appeared in the Intelligenzblatt for Saturday, March 19, 1803 (number 59):

> Bey den Gebrüdern *Levrault*, Buchhändlern in Paris und Strasburg sind folgende Bücher in Menge zu haben:
>
> [entry on p. 491, third column of entire list]
>
> Flora Boreali-Americana, sistens 2000 plantas, etc., c'est-à-dire, *Flore de l'Amérique septentrionale*, contenant plus de 2000 plantes, dont la plupart n'avaient jamais été décrites; par *Michaux*, auteur de la description des chênes, naturaliste voyageur dans l'expédition du citoyen Bodin, avec plus de 50 figures de plantes dessinées par Redouté et gravées par Plée; 2 vol. in 8.
>
> *Idem*, 2 vol. in 4. papier-vélin.

Michaux's Flora must, therefore, have been published before March 19, 1803.

In the Botanische Zeitung, a journal founded in 1802 by the Botanical Society of Regensburg, there appeared in volume II, in the number for Monday, March 14, 1803, a notice from Berlin which is quoted here:

> Berlin. Die Willdenowsche Ausgabe der Linnéischen Specierum plantarum wird nun schnell auf einander folgen, indem bereits der 3te Theil des 3ten Bandes unter der Presse ist, der mit Syngenesia anfängt, und sehr interessant werden dürfte.

Since on March 14, 1803, volume III part 3 was still in press, it could hardly have been published before March 19 of the same year, when Michaux's Flora was announced as having been already published, and for sale.

Kuntze's decision, to give Michaux precedence over Willdenow (volume III part 3 but not part 2) was therefore correct, although hardly for the reason which he gave. The dates for volume I and volume III, parts 1 and 2, might well be taken from the publisher's announcement rather than from the trade catalogue of at least 30 years later.

A tabulation of the pertinent dates of Willdenow's work follows:

Volume no.	Date given on title-page of volume.	Date given by Kuntze in Rev. Gen. i. cxxiv. (1890).	Date supplied in publisher's announcement.	Date of publisher's announcement.
I[1]	1797	1798	1797	Nov. 4, 1797
I[2]	——	1798		
II[1]	1799	1799	1799 (by inference)	Feb. 1, 1800
II[2]	——	1800		
III[1]	1800	1801 (to page 850)	1800	Jan. 7, 1801
III[2]	——	1803 (to page 1470)	1802	Nov. 10, 1802
III[3]	——	1804 (to page 2409)	1803 (by inference)	Mar. 14, 1803 (as in press).

Gray Herbarium.

Two Albino Forms of Echinacea from Missouri—In his revision of *Echinacea* Sharp[1] did not list or recognize any white-rayed forms of species within that genus. For the last ten years the writer has known of a white-rayed variant of *Echinacea pallida* Nutt., infrequently encountered on the limestone glades of eastern and southern Missouri. In 1941 Mr. William E. Liggett of University City, Missouri, called the writer's attention to another white-rayed form occurring in *Echinacea purpurea* (L.) Moench. Both forms are known to breed true.

Since apparently neither of these white-rayed variants has received recognition, they may be designated as color forms differing from the respective species in no essential morphological details other than color variation. It is a pleasure to associate the name of the discoverer with the following form.

Echinacea purpurea (L.) Moench, forma **Liggettii** Steyermark, forma nova—A forma typica differt ligulis albis. Missouri: highway 54, west of Niangua River, Dallas Co., transplanted to yard of Mr. William Liggett in University City, Saint Louis Co., July 9, 1940, *William E. Liggett 1* (type, in Herb. Field Mus.).

The other variant may be called

Echinacea pallida Nutt., forma **albida** Steyermark, forma nova—A forma typica differt ligulis albis et floribus disci luteis. Missouri: limestone glade on top of bluffs along Plattin Creek, T 38 N, R 6 E, sect. 7, Koester Springs at Koester, Saint Francois Co., June 4, 1941, *Steyermark 28797* (type, in Herb. Field Mus.).

[1] Sharp, Ward M. Ann. Missouri Bot. Gard. 22: 84–95. 1935.

In this form the disk is yellow instead of orange- or ruddy-brown, the rays are white, the leaves are paler green, and the stem is pale yellow-green instead of darker green or brownish-purple.—J. A. Steyermark, Field Museum.

Formal Transfers in Cyperus.—

Cyperus esculentus L., forma **angustispicatus** (Britton), stat. nov. Var. *angustispicatus* Britton in Bull. Torr. Bot. Cl. xiii. 211 (1886). Var. *leptostachyus* Boeckl. in Linnaea, ser. 2, xxxvi. 290 (1870) as to description, not as to much of the synonymy.

C. esculentus, forma **macrostachyus** (Boeckl.), stat. nov. Var. *macrostachyus* Boeckl. op. cit. 291 (1870). *C. Hermannii* Buckl. in Proc. Acad. Sci. Phil. (1862) 10. *C. esculentus*, var. *Hermannii* (Buckl.) Britton, op. cit. 214 (1886).

The two extremes of *Cyperus esculentus* with spikelets 2–3 cm. long are striking departures from typical *C. esculentus*, with spikelets 0.5–1.5 cm. long, but they are forms rather than geographic varieties. In forma *angustispicatus* the very narrow spikelets (1.5–2 mm. broad) taper to slender points; in forma *macrostachyus* they are exactly linear, 2–3 mm. broad and rounded at tip. Although Boeckeler's var. *leptostachyus*, as described, seems to have been the plant I am calling forma *angustispicatus*, he cited no type (as he did for his var. *macrostachyus*) and included under it essentially all North and South American material, with a bibliography including many American references to ordinary *C. esculentus* with short spikelets. Kükenthal, likewise, taking up var. *leptostachyus* for most American plants, accepts the inclusive bibliography of Boeckeler. I therefore take up the later name of Britton, that having no such obscurity as to its application.

C. dentatus Torr., forma **ctenostachys** (Fernald), stat. nov. Var. *ctenostachys* Fernald in Rhodora, viii. 126 (1906).

This plant with many-flowered elongate spikelets proves to be without distinct range and to be an extreme form rather than a geographic variety. M. L. Fernald

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Some Color-Forms of Gentiana Porphyrio.—The discovery by Mrs. J. Norman Henry near Wilmington, North Carolina, as reported by Dr. R. T. Clausen in Bull. Torr. Bot. Cl. lxviii. 662 (1941), of pink-flowered plants growing with the

typical azure-flowered plant clarifies the identity of *Gentiana Porphyrio* J. F. Gmel. It is now reasonable, as Dr. Clausen points out, to interpret Gmelin's name, given as a substitute for *G. purpurea* Walt. Fl. Carol. 109 (1788), not L. (1753), as resting on the purple or pink extreme, which, farther north at least is very unusual. In a damp sandy field west of Warren Grove, Ocean County, New Jersey, Mr. John Gill has found a colony with amazing color-variations, including typical "lavender"-flowered *G. Porphyrio*, azure-flowered *G. Stoneana* Fernald in Rhodora xli. 555, t. 579 (1939), other plants with the corolla white but with broad greenish backs to the lobes, and others variously combining blue and white. A series of these variations, collected by Mrs. Allan (Eleanor C.) Marquand, on October 3, 1940, is preserved in the local Herbarium of the Academy of Natural Sciences of Philadelphia and I am indebted to Mr. Long for an opportunity to study it, and for duplicate material of the albino. Since these plants are now coming into cultivation it will be convenient to have formal names for the more distinctive color-forms.

Gentiana Porphyrio J. F. Gmelin, forma **Stoneana** (Fernald), stat. nov. *G. Stoneana* Fernald in Rhodora, xli. 555, t. 579 (1939).

Forma **albocaerulea,** f. nov., corollis albidis caeruleo maculatis vel variegatis.—New Jersey: damp sandy field west of Warren Grove, Ocean County, October 3, 1940, *Eleanor C. Marquand* (type in Herb. Phil. Acad.).

Forma **albescens,** f. nov., corollis albidis plus minusve viridi suffusis.—New Jersey: damp sandy field west of Warren Grove, Ocean County, October 3, 1940, *Eleanor C. Marquand* (type in Herb. Gray). M. L. Fernald

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 44. May, 1942. No. 521.

SUBSPECIES AND VARIETY

F. Raymond Fosberg

In a recent discussion (Rhodora **43**: 157–167. 1941) R. T. Clausen presents a point of view on subspecies and varieties fairly widely held among American botanists, though not much subscribed to elsewhere. Fernald has previously presented an opposite point of view (Rhodora **42**: 239–246. 1940).

Clausen invokes a lengthy historical argument, the previous confusion in the use of 'variety,' and the necessity of cooperation with zoology to justify the use of 'subspecies' for "the most important variations under the species", restricting the use of 'variety' to "mere trivial genetic variations" "as the horticulturists do." The supporters of the now defunct American Code of Botanical Nomenclature and H. M. Hall and his followers have previously used the same arguments to arrive at the same conclusions. In Hall's own reasoning there was, however, a subtle difference, which will be brought out later.

Fernald advocates the use of the term subspecies for "a subdivision of an aggregate species, *Gesamtart* or *species collectivus*," and the term *varietas* for geographic variations of ordinary species, with variations which have no separate geographic ranges to be designated as *formae*. How he distinguishes between aggregate and other species is not too clear, except that he says that many botanists, including himself, regard the subspecies within them as deserving the rank of species.

That Fernald's view is at least nearer the correct one, nomenclaturally, may be seen by examining the system of categories set up in the present International Rules. Three, or, if desired, even

more categories beneath the species are provided. The lowest of these three is *forma.* Clausen suggests no provision for more than two categories, and of these the most trivial is 'variety' or '*varietas*.' One is led to wonder what he would suggest as a term for the subdivisions of aggregate species. Clausen makes no mention of aggregate species, though, so perhaps we may assume that his concept of species and that of Fernald (excluding collective species) are essentially similar and that his 'subspecies' is synonymous with Fernald's '*varietas*' and his 'variety' is synonymous with Fernald's '*forma*.' This is, however, hard to reconcile with his statement on p. 166, "On the other hand, some of the species of the older botanists are only subspecies, since large series today demonstrate intergradation." What a slaughter this point of view would create among the species of *Rubus*, *Aster*, *Pinus*, *Quercus* and other genera where the specific lines are notoriously indistinct! Also, what of those otherwise perfectly distinct species which form hybrid swarms where they meet?

Clausen mentions H. M. Hall as favoring the use of the term 'subspecies' for the primary divisions of species as though this were in support of his own argument. Actually Hall's usage better supports Fernald's concept of subspecies as subdivisions of aggregate species. Certainly most of Hall's subspecies are or have been regarded as species by some other botanists, and many of his species would be admitted by any botanist to be 'aggregate species.' All of the lesser variations, including many so-called 'species' he threw into an unclassified category of "minor variations and synonyms."

The continued appeal to historical precedent may be interesting, but seems to me to have very little point in this connection on either side. Modern taxonomy is based on so much more information than was available to Linnaeus and the other older workers that their concepts can have but slight significance in the determination of the application of the present day nomenclatural equivalents of these concepts. Faced with the necessity for a simple method of expressing an infinitely complex situation, botanists have agreed upon a hierarchy of categories. To simplify the application of names, the designations of these categories were made to agree as far as possible with those used

by the pre-evolutionary botanists. Any attempt to attach further significance than this to the historical background merely adds to the lamentable state of confusion which bothers so many of the writers on this subject.

If previous confusion is of significance in determining present use of categories, then certainly 'family,' 'genus,' and 'species' should be the ones to be thrown out, as they have been the subject of more confusion than has ever surrounded any intraspecific category. And if cooperation with, or imitation of zoologists is to be a deciding factor, certainly one of the first necessities is to eliminate the multitude of generic homonyms in the combined system, and another is to induce one or the other group to bring the suffixes for its higher categories into conformity with those of the other. Of course, none of these changes would likely be seriously recommended by anyone.

The solution seems actually simple enough, if one recognizes that there are many types of evolutionary process in operation, producing many kinds of species, and that intraspecific units may be incipient species in various stages of development. These stages may be at least roughly indicated by the categories in which the groups are placed. Each taxonomist may take the system of categories set up in the International Rules and apply it to the groups of plants with which he is working in the way that, in his judgment, best expresses the relationships of the groups of individuals concerned. The Rules require only that the order of the categories be not disturbed, and that each plant be placed in a species, genus, family, order, class, division and kingdom. All other categories are to be used at the discretion of the worker. In this way the system will retain the flexibility that is absolutely essential to make it fit the wide variety of evolutionary situations to which it must apply. Discarding of any of the categories, whether from reasons of historical confusion or personal prejudice, impairs this flexibility.

Since the above was written my friend Joseph Ewan, in a recent discussion (Bull. Torr. Bot. Cl. **69:** 138–149. 1942), recommends "the use of the term subspecies to replace the more inexact and variously used term variety," and at the same time deplores the practice of making new combinations for names originally proposed in one of these categories when they are

transferred to the other. Apparently to be consistent with this, in spite of his immediately previous statement that he remains "confident of the enduring value of the use of the term subspecies" and the implication that he will use it in place of variety, on p. 141 he uses *D. hanseni* var. *arcuatum* Greene, and on p. 143 *D. hanseni* var. *kernense* Davidson, but on p. 147, *D. patens* subsp. *montanum* (Munz) Ewan for an apparently coordinate subdivision. In the discussion, on p. 139, however, he says, "To obviate this persistent confusion, . . . it seems to me desirable to adopt the straight trinomial when referring to the rank below that of the species." On p. 140, in a footnote, he says, "It is the author's express intent to avoid *formal* establishment of any name for *typical* subspecies, i. e., '*D. hanseni hanseni* nomen nov.', but to indicate by such usage that the typical phase of the species is intended. Technically such trinomials should be credited to Greene; . . . " On page 141 he uses *D. hanseni hanseni*, referring to it as a subspecies. One could not wish for a better example of the way in which the "persistent confusion, which cannot but reflect discredit upon systematic botany" is compounded. It is perfectly obvious that a non-systematic botanist could not possibly follow what Mr. Ewan is talking about, and equally obvious that he has not studied very carefully Articles 12 and 13 of the International Rules for Botanical Nomenclature. Such ambiguity has run almost universally through the writings of those who have recommended the use of the term *subspecies* in place of *varietas*, and yet their principal argument is the confused and inexact application of the term variety. In the light of Articles 12 and 13 it is perfectly plain that a transfer from one to the other of these categories must be accompanied by a change in authority and that the straight trinomial is completely meaningless. In the light of plain common sense it is obvious that if a name is used in print, i. e., *Delphinium hanseni hanseni*, it is published, and that Greene cannot be the author of the trinomial. Its author is Ewan. Greene was dead long before this trinomial was thought of.

It might be added that, in spite of Ewan's statement on page 139, lines 16–19, the practice of repeating the specific epithet for the designation of the typical subspecific unit has been followed in America by Dr. Rogers McVaugh (Mem. Torr. Bot.

Cl. **19** (4): 23, 27, 51. 1941; Am. Midl. Nat. **24:** 687, 695, 697, 1940; Ann. Mo. Bot. Gard. **27:** 347–349. 1940) and by myself in a number of as yet unpublished papers and in at least two published ones (Am. Midl. Nat. **26:** 69. 1941; Lloydia **4:** 275. 1941). Dr. Gleason has told me that he has definitely published the proposal, for action at the next Botanical Congress, that this method be made mandatory. The last example by McVaugh, cited above, is also an excellent example of a place where the use of both categories, *subspecies* and *varietas*, is desirable within the same species.

Finally, concerning the confusion surrounding the term 'variety,' most of those who dwell upon this confusion seem to overlook the fact that the confusion is about the term 'variety' while the category in the Rules is '*varietas*.' Botanically there has been relatively little confusion of the meaning of the Latin term. If one is worried by the confusion surrounding the English translation of this word, he should look up the English translations of the words '*genus*' and '*species*' in a good Latin-English dictionary (i. e. Cassell's) and see what confusion emerges. All three terms were good Latin words long before they were adopted by botanists, and had their popular meanings and attendant confusions. It seems to serve no good purpose to disturb legitimate botanical usage by recourse to arguments based on popular, horticultural, or even past botanical confusion.

Division of Plant Exploration and Introduction,
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SUBSPECIES

C. A. Weatherby

Dr. Fosberg hardly needs support; yet the following rather desultory remarks, to be regarded as in the nature of footnotes, may perhaps usefully supplement his excellent discussion.

He is, of course, right in maintaining that present usage is of more importance than past; yet something may be learned from history, if only that arguments drawn from it may be worthless. In looking over the three preceding articles, I have been struck by the fact that Clausen places his chief emphasis on definitions,

Fernald and Fosberg on practice. From the latter standpoint, the use of the term variety presents a natural and normal development. Linnaeus and his immediate successors used it for any and all groups subordinate to the species. As European floras were intensively studied, it was recognized that there were different grades of variants within species and a series of categories was accordingly worked out in the effort accurately to represent the observed facts of nature. In the "Lois" of 1867 de Candolle enumerated six such categories[1] and by 1905 this system had so far proceeded that there was included in the International Rules a provision designating variety and form as the terms primarily to be used for categories below the species, with a number of others, including subspecies, to be inserted, if desired, above, below and between them, and allowing authors full liberty to interpolate new categories as needed. This section (11) remains unchanged in the present rules[2]. In America, with larger areas to cover and much less detailed knowledge of their floras, a simpler system has for the most part been followed; but as early as 1856, in the second edition of his Manual, Dr. Gray was distinguishing major and minor varieties[3]. In both continents, as accumulating material in herbaria came to show ranges with reasonable reliability, geography, as a convenient test of the probable validity of varieties, came more and more into use. From the point of view of practice, all this development, though of course not even and symmetrical, has proceeded hand in hand with the increase of knowledge. The division of the Linnaean variety into several categories is roughly analogous to the division of aggregate Linnaean genera and species, and the addition of the geographic idea to the concept of variety comparable to the redescription of the older groups by the addition of newly discovered characters.

To Clausen, looking mainly at definitions, differences and developments in practice appear only laxity in the use of terms,

[1] See Weddell's translation, with comment by Asa Gray, in Am. Journ. Sci. ser. 2, xlvi. 63–77 (1868).

[2] As Fosberg points out, this is a flexible system, accommodating readily both authors who use only a single category and Ascherson & Graebner with their ten.

[3] His method of distinguishing them, by paragraphing and typography, was not altogether a happy one, since it was obvious to the eye alone and allowed the use of the same spoken term for both. It was, of course, to correct this that the term forma came into use for essentially his lesser varieties.

and the introduction of the geographic test for varieties a violent departure from precedent. The trouble with this view is that, in so plastic and multiform an assemblage as the vegetable kingdom, precise and comprehensive definition of taxonomic categories is, in the absence of precise and comprehensive knowledge, a difficult and even dangerous business. Professor L. H. Bailey shows the wisdom of long experience when he remarks: "I define a variety as a lesser category of a species: other definitions do not hold water, being too philosophical or too subjective."[1] Linnaeus, inaugurating a system, no doubt felt obliged to offer some sort of explanation of his categories. He drew up a definition of variety based on certain observations of Ray (and presumably of his own) on garden plants, in which inconstancy was the important feature—and was at once compelled to force under it many groups of whose constancy or inconstancy he knew nothing[2]. Rather unfortunately, various more modern taxonomists (including, in a very modest way, myself) have also felt impelled to make definitions. I think it safe to say that, because of inadequate knowledge for generalization, not one, from Linnaeus to du Rietz, has been able to produce one which either he or anyone else could apply, over any wide field, with consistency or satisfactory results. This condition Clausen hopes to see corrected by the use of data provided by that immensely promising line of research, experimental taxonomy; but almost in the same breath he is forced to admit that it cannot now be done. "The biologically most important unit under the species is the ecotype, which can be determined only by experiment . . . Taxonomists, by the usual observational methods, can often detect geographic and ecologic variations which are the counterpart of the ecotype. Such variations are the taxonomic subspecies." "When the experimental part of the work has not been done, the . . . designation subspecies should be used alone." Clausen, then, is in the same position as was Linnaeus. Starting with a relatively insignificant body of experimental data, he has to deal with a vast number of plants in regard to which he has no

[1] Gent. Herb. v. 18 (1941).

[2] Dr. Clausen's account of the Linnaean varieties would perhaps have been more adequate had he taken the unnamed ones into consideration. So far as I can see, they are quite as important as the named in indicating Linnaeus's ideas; some of them, like *Eupatorium purpureum* β, he later raised to specific rank. There is no obvious reason why he gave names to some and not to others.

comparable information; and he can find no better method than the ordinary exercise of taxonomic judgment, as practiced by Linnaeus and every other systematist, past and present. Of course, we can and do, with the knowledge accumulated since his time, turn out a greatly better job than Linnaeus could; but until that knowledge is complete, so long, that is, as we have to use judgment at all, the accuracy and soundness of the application of any taxonomic category, definition or no definition, will be in direct proportion to the accuracy and soundness of judgment of the individuals who apply it. This situation is not affected by any shifting of terms. This, of course, is not to say that the exercise of taxonomic judgment has not produced and will not produce very excellent results. The point is that Clausen has nothing new to offer to justify a revision of terminology—still less, a disruption of it.

It may be worth while to examine in how far the contention that subspecies is a more accurate term than variety is borne out by evidence, particularly as regards recent usage in the United States. "Subspecies" did not originate with Persoon; he did not use the term in any systematic way and seems to have been referring vaguely to some previous employment of it. What he had in mind was very likely Link's "Philosophiae Botanicae Novae Prodromus" (1798), in which (p. 187) subspecies are defined as strains "many of which are in cultivation and have become almost hereditary", which commonly come true from seed, but originally arose from the progeny of a single individual. Varieties, in Link's view, did not come true. Sprengel (Anleit. i. 372–3 (1817)) makes practical application of these ideas, designating as subspecies, on a strict basis of experimental taxonomy, cauliflower and Savoy cabbage[1]. De Candolle's "Lois" of 1867 still used subspecies for the most striking modifications of cultivated species. All this is more curious than important; but it is not without interest to observe that subspecies had as lowly a horticultural origin as variety; that from the beginning it was

[1] Anyone further curious about the history of subspecies may consult Dampier, Voyage, iii. 75 (1699), "there are . . . four sorts of these longleg'd Fowls . . . as so many Sub-Species of the same kind; viz. Crab Catchers, Clocking-Hens . . . ": Aikin, Dict. Chem. & Min. ii. 13 (1807), "Arseniat of Lead; of this there are two subspecies": Encycl. Britannica, ed. 9. xii. 19, "verse narrative . . . is . . . a subspecies by itself." Followers of Hall may take what comfort they can from the fact that Link also refused to give names to varieties.

used in the sense aptly characterized by Dr. Gray as a "super-variety"[1]; and that it has ascended the taxonomic scale *pari passu* with variety and inseparable from it.

The followers of the American Code, in practice, applied subspecies indiscriminately to anything below the rank of species[2]. The work of Hall and his collaborators was, in part, a protest against the excessive splitting of Greene and his followers. In consequence, his subspecies were of very high morphological content and took no account of geography; they are the equivalent of the extreme of European usage—minor species, grouped under collective species and called subspecies. This fact, however, was obscured by Hall's failure to give any place to lesser variants which he recognized and described but would not name, partly because of uncertainty as to their nature and partly because of a prejudice against the term variety. The result is a rather curious mixture of the form of the American Code and the substance of Aschersonian systematics.

Pennell, using the three categories, subspecies, variety and form, unreservedly accepts du Rietz's purely geographic system. The result is a great lowering of the morphological content of the subspecies, as compared to that of Hall, and the almost complete disappearance of any morphological distinction between subspecies and variety. "*Lindernia dubia major* var. *inundata*", for instance, characterized by shape of leaf, length of pedicel and habit, is a variety because it occurs at more or less scattered stations within the range of the species. "*Pagesia acuminata microphylla*", distinguished by precisely the same sort and degree of variation in shape of leaf, length of pedicel and habit, is a subspecies because it is found in a single region in Alabama on the southern edge of the range of the species.[3]

[1] [Varietas] "nonnisi gradu a subspecie differt". Link. For most of these references I am indebted to Prof. A. S. Pease and Dr. H. K. Svenson.

[2] The use of subspecies in the American Code appears to have been an afterthought, due probably to ornithological influence. In the earlier versions of and discussions about the Code, variety was used; only in the final revision, published in 1904, was it "relegated to horticultural usage."

[3] It is interesting to observe that Pennell, equipped with unusually ample geographic knowledge of his group, and freely recognizing subspecies and formae, could find in eastern North America only four populations which answered to du Rietz's definition of variety, and that all four of these are estuarine. Their "local" distribution is therefore due to preference for a highly specialized habitat and is an essentially ecological, not geographic, phenomenon. Had the Atlantic coast of the United States been arranged like the Pacific, with a single large river at the north and no

Clausen, in his one major attempt to put his system into practice, keeps the exclusively geographic criterion for subspecies, but denies it to varieties, degrading that category to the level of the forma (a term which he does not use) of du Rietz, Fernald and Pennell. One might expect that this would produce a definite gap between subspecies and variety; on the contrary, any morphological difference between them again almost completely disappears. *Botrychium multifidum* ssp. *typicum*, "of medium or small size . . . the ultimate divisions usually rather crowded and sometimes overlapping", and ssp. *silaifolium*, "rather large . . . the ultimate divisions rather remote and not imbricate", are treated as subspecies. *B. Schaffneri* var. *typicum*, "lax and large", and var. *pusillum*, "stout, compact and small", appear as varieties. And at least some of the varieties of *Ophioglossum nudicaule* have a far stronger morphological basis than the first two subspecies of *O. lusitanicum*.[1]

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estuaries elsewhere, the *Lindernia* could have occurred only at the northern edge of the range of the species and would automatically have become a subspecies. Should the *Pagesia* be discovered at an isolated station or two in the Carolinas (as a good many species have been found in the white-sand areas of Wilmington, North Carolina, and southeastern Virginia and not between), it would, equally automatically, become a variety. Nothing could better illustrate the limitations of a purely geographic criterion of infraspecific categories and, unless one denies all importance to morphological characters, the artificiality of the system which may result from its use. Geography is not a character; it is rather a reagent. Since isolation tends to preserve genetic lines, it is, in the absence of experiment, a handy test of the probable permanence of variants; it can be nothing more. (Du Rietz, Fundamental Units of Biological Taxonomy, in Svensk Bot. Tidskr. xxiv (1930), especially pp. 348–357; Pennell, Scrophulariaceae of eastern temperate North America, Acad. Nat. Sci. Philadelphia, Mon. i (1935)).

[1] Clausen, Monograph of Ophioglossaceae. Mem. Torrey Bot. Club, xix (1938).

Not only are the characters of ssp. *silaifolium* the same as those of varieties in other species; they are exactly the sort of modification one would expect to appear in the milder climate and more favorable growing conditions of the more southern area which it inhabits. It is true that experiment in California has shown that some large and small forms of the same species occurring at different altitudes remain unchanged when transplanted to other environments. Nevertheless, this and such cases as *Asplenium platyneuron* var. *bacculum-rubrum*, *Dryopteris fragrans* var. *remotiuscula*, and *Botrychium virginianum* var. *intermedium*, offer inviting subjects for experimental testing. I hope someone can apply it to them.

I am, of course, aware that the same character may have very different degrees of taxonomic importance in different groups. But in the instances cited from Pennell and Clausen, there is no evidence that they perceived anything of the sort or paid attention to any but purely geographic considerations. In any case, I am only applying, from the morphological point of view, the same test which Clausen applies, from the geographic, to the varieties of Gray's Manual. I hope I have done it more carefully and candidly than the anonymous colleague who "analyzed" 105 "unselected" varieties of the Manual without ever noticing whether they were major or minor varieties. Had he confined himself to the criticism that some varieties were geographic and some not, no exception could have been taken to his procedure; but

Irmscher, attempting to apply du Rietz's system to Chinese Begonias, arrived at results like those of Pennell and Clausen, but, unlike those authors, was far from pleased with them. Groups, he says, which he could only regard as of equal phylogenetic rank became, according to their ranges, partly subspecies, partly varieties. Even du Rietz's test for species, discontinuity of biotypes, broke down in this group when tried out from the morphological angle. Irmscher became so disgusted with the "gemischtrangige Sippenreihe" which emerged from the du Rietz system that he threw it overboard altogether, substituting a primarily morphological one of his own and in the process discarding the term subspecies as (of all things) *too confused*, and putting a new term, turma, in its place.[1]

Finally, there is a contemporary instance of the classical use of subspecies which deserves brief attention because of its exceptionally clear-cut character. Tryon has recently published a revision of the genus *Pteridium*.[2] His point of view is conservative; it would have had the approval of Prof. Hall. He reverts to the old concept of *Pt. aquilinum* as a polymorphic cosmopolitan species. He finds, however, that it breaks up into twelve varieties, distinguished by relatively minor characters, all geographic and all intergrading where their ranges touch. These varieties in turn fall into two larger groups, also geographic and also not sharply disjunct, but connected, morphologically and seemingly genetically, by var. *yarrabense* (southeastern Asia to northern Australia), which produces intermediates with both (though their extremes do not cross where they meet in the American tropics) and cannot be dismissed as a hybrid swarm since it is reasonably uniform over a wide area where no possible parent exists. Under the system of du Rietz, Pennell and Clausen, Tryon would have had to call his lesser groups subspecies;[3] yet he could not have called the larger ones species because they lack the required discontinuity. On the other

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when he complains that some are mere modifications and others equivalent to subspecies and fails to mention that an attempt (however unsuccessful he may consider it) to grade varieties on just this basis was made, he is not playing fair.

[1] Irmscher in Mitth. Inst. Bot. Hamburg, x. 459 (1939).

[2] In Rhodora xliii. 1–31, 37–67 (1941) (Contrib. Gray Herb. 134). Tryon's work was done as a candidate for the doctor's degree under my general supervision; but his taxonomy is wholly his own.

[3] Hultén, Fl. Alaska in Lunds Univ. Arsskr. N. F. Avd. 2, xxxvii. no. 1, 44 (1941), has done so.

hand, had he followed Hall's practice, or any other using only one category below the species, he would either have had no place for his lesser, geographically distinct, groups, or would have had to put them in a single series with no indication of their relative affinities. It is sometimes difficult to distinguish between the moving up and down of categories in the morphological scale attendant on splitting and lumping and a shifting which actually disrupts the taxonomic series and diminishes its responsiveness to the varied facts of nature. *Pteridium* and cases like it are good testing agents.[1]

From this rather casual survey, it appears that subspecies began as a term for minor horticultural strains and that all recent redefinitions of it are quite as reprehensible departures from the original as are those of variety; and that, in the fifty years since its comparatively peaceful and consistent development was disturbed by the American Code, it has acquired quite as many different uses (except the horticultural) as variety. It has been all-inclusive and highly specialized; of morphological content so high as to be equivalent to the Englerian subspecies and so low as scarcely to differ from the classical forma; it has been geographic and non-geographic, experimental and non-experimental; finally, it has achieved the ultimate ignominy of being cast into an outer darkness even blacker than that prepared for variety by the American Code. There is little here to support the contention that it has any inherent superior accuracy.

[1] There are no doubt a considerable number of groups in the east-American flora in which, unless we are to disregard entirely number and kind of characters and adopt a wholly behavioristic classification—I use the adjective with apologies to the philosophers—degrees of relationship would be better shown by a three- or four-story system than by any simpler one. Three such groups with which I happen to be familiar are those of *Dryopteris spinulosa, Acalypha virginica* and *Eupatorium purpureum.* All are alike in that their members are obviously much more closely related to one another than to any other members of their genera and have been treated both as species and varieties by different authors in the past. In other respects, the groups are unlike. The three components of the first are geographically separated, but their ranges overlap considerably and where they do hybridization is fairly frequent. There are no very good varieties. In the second, there is no geographic and little ecological segregation, and also little crossing; two of its three members have readily recognizable geographic varieties. The third shows an intermediate condition; its four members are somewhat, but not sharply, separated geographically and ecologically, there is some apparent interbreeding and there are two regional, not very strong, varieties. All the members of all three are a bit weak as species, though they have usually been treated as such by recent authors; certainly they are not coördinate with other species of their genera. They cannot be fully accounted for by any purely geographic system, nor by any which depends at all rigidly on discontinuity; but the classical system of subspecies, variety and forma (there is some room for formae in them) puts their classification into very good order.

The zoological analogy has attracted others beside Dr. Clausen; but is it real? Is there any sound basis for uniformity of usage in vertebrate zoology and botany, or would it prove a forced and unnatural hybridization? The organisms with which the two disciplines deal are very different. It can hardly be without significance that in the best-known zoological groups the simplest series of categories has been developed, whereas the most elaborate series of botanical categories appears in the most intensively studied groups and floras. If there is to be correspondence, one would suppose that it would naturally be with that department of zoology which, in number of species and as yet imperfect knowledge of them, most nearly approximates the conditions in botany and which, moreover, in some of its families has the closest biological connection with plants—namely, entomology. Those who talk largely about uniformity between botany and zoology do not mean zoology as a whole; at most they mean vertebrate zoology and more often, I suspect, no more than ornithology.[1] They do not tell us that zoological usage is not uniform, that the rigidly geographic, single infraspecific category of the ornithologists does not everywhere obtain. In entomology, the botanical series of subspecies, variety and form (sometimes further elaborated) is being used in the classification of *Lepidoptera* and *Coleoptera;* in that of ants, subspecies and variety are regularly employed for different grades of variation within species. What their morphological level may be, I do not know; I am here on unfamiliar ground; but there seems no doubt that, confronted by similar conditions, the entomologists have developed a system more like the botanical than that is like the ornithological.[2]

In any case, if there is to be correspondence, why not have the vertebrate zoologists adopt the botanical way? They would gain a good deal.

As to horticultural usage, it is almost enough to say that the botanist who has had the longest and closest connection with it,

[1] Of the zoologophilous botanists who have come to my notice, only Coville and Clausen have been definite enough to say this; even they are silent as to entomology.

[2] For chance examples of the contemporary use of variety and of three categories (but not the term forma) in entomology, see articles by Normand & Vidal in Bull. Soc. Hist. Nat. Afrique du Nord, xxx. (1938) and by Hustache in Bull. Mans. Soc. Linn. Lyon, x. 5 (1941). For information as to entomological usage I am indebted to Prof. C. T. Brues.

L. H. Bailey, goes on undisturbedly using variety in his botanical work. It may be added that the horticulturalists themselves are dealing vigorously and clear-headedly with the matter.[1]

What Dr. Clausen really asks is that we all accept the terminology employed by the experimental taxonomists now working in California. It is not unfair to say that this terminology is a sort of ecotypical habit, characteristic of a relatively small population isolated in the United States of America. Even so, it might be the coming thing and we might, with due adjustment of the rules, accept it if it had any organic connection with the greatly promising work its protagonists are doing—as, I hope, we shall accept the really organic term apomict for the asexual variants in ligulate *Compositae*.[2] But it has no such connection; it appears, rather, to be an uncritical carrying over of Hall's personal practice to concepts different from his and set against a different nomenclatural background.

The experimental approach has, so far, wrought no revolution in taxonomy. It has, in some cases, revealed an almost terrifying complexity of forces underlying the morphological expressions we know; it has discredited, finally we hope, ill-considered splitting; but in general, save in places where taxonomists have been uncertain, it has supported their conclusions.[3] It has shown that the characters of gross morphology which they, of necessity, have used, really are significant. All this is immensely valuable and, to old-fashioned taxonomists, heartening. We are familiar, under other names, with cenospecies which cannot cross with one another, with ecospecies which will hybridize weakly, with ecotypes which cross freely, given the physical opportunity, and produce series of intermediates; but hitherto there has been an element of conjecture about them. We are grateful that a foundation of experimentally tested fact is being built under them; we are ready to welcome any readjustments of the taxonomic structure which may be proved necessary; but we do not see that these things call for any revision of taxonomic terminology.

[1] See, for instance, Stout in Amer. Journ. Bot. xxvii. 339–347 (1940) and the introduction to the new edition of Standardized Plant Names.

[2] Stebbins's system of treating these dead-end strains as minor units grouped around the species which they most resemble or from which they are known to have been derived seems preferable to Turesson's treatment of them as agamic species. See Stebbins & Babcock, American Species of Crepis in Carnegie Inst. Pub. 504 (1938).

[3] Cf. J. Clausen, Keck & Hiesey in Amer. Journ. Bot. xxvi. 104 (1939).

And we wish that the experimenters had looked into this phase of the matter far enough to perceive that clarity is not only not to be achieved by a shifting of terms, but is actually hindered thereby.

Insistence by the makers of the American Code on unessential details and disregard by them of majority usage, when a little yielding to it would not have harmed their major position, brought about thirty years of needless nomenclatural controversy. The most obvious result of a similar insistence on "subspecies" and a like disregard for the use of it by most botanists in the past has been the unedifying spectacle of one group of taxonomists busily transferring varieties to subspecies and another group equally busy making transfers in the opposite direction—a tempest in a teapot also quite needless. All difficulty not wholly illusory would have been avoided by the simple, and one would suppose the obvious, expedient of following the rules and using variety as the term primarily to be employed for subdivisions of species. If the workers in experimental taxonomy have convinced themselves that only one infraspecific category is worth while[1], so be it; if they can prove it, well and good; variety would still better serve their turn and would meet with no opposition.

Gray Herbarium.

THIRD LIST OF FUNGI OF NANTUCKET[2]

E. F. Guba and E. V. Seeler, Jr.

Sufficient further collections have been studied to make possible a third list of fungi of Nantucket. Several specimens collected in previous years still remain to be determined and much further work is required before the record of the fungous flora of the island can be considered fairly complete.

Certain numbers of fleshy fungi appearing in this list and indicated by an asterisk are taken from a list of names submitted

[1] Americans, in line with previous practice in this continent, mostly use only one. So far as I have observed, Europeans, though they have lowered more or less the morphological content of the subspecies and, in consequence, use that term more frequently than in the past, still freely employ two or three categories.

[2] Contribution of the Nantucket Maria Mitchell Association, Div. of Natural Science, Nantucket, Mass. For the first and second lists see Rhodora 39: 367–376, 1937, and 41: 508–520, 1939. The cost of publication is met by the Maria Mitchell Association.

to the Nantucket Maria Mitchell Association in 1939 by Dr. Jacob E. Lange, Director, Fyns. Husmandsskole, Odense, Denmark. Dr. Lange's records are based on material which he collected on Nantucket in August 1927 and September 1939. Other collections and identifications mentioned in this and previous lists were made by Linder (Harvard University), Diehl and Cash (United States Department of Agriculture), Rice (Wheaton College), Gilgut (Massachusetts State College) and others. The writers are most grateful to them for their collaboration.

201. Alternaria sonchi J. J. Davis. On leaves of *Sonchus arvensis* L. Generally present. August, 1937. Coll. and det. by *E. F. Guba.*

202. Amanita phalloides (Bull. ex Fr.) Fr. On ground near pines south of Fair Grounds, and in Saul's Hills. July 24, 1938. Coll. and det. by *E. V. Seeler, Jr.* Quite common, and most poisonous.

203. *Amanitopsis strangulata (Fr.) Karst.

204. *Amanitopsis vaginata (Bull.) Karst.

205. Amanitopsis vaginata (Bull.) Karst. var. fulva (Schaeff.) Sacc. Hidden Forest, July 27, 1940. Coll. and det. by *D. H. Linder.*

206. Arcyria cinerea (Bull.) Pers. On decaying wood, Hidden Forest, August 5, 1938. Coll. and det. by *E. V. Seeler, Jr.*

207. Arcyria denudata (L.) Wettstein. On decaying wood, Hidden Forest, August 5, 1939. Coll. and det. by *E. V. Seeler, Jr.*

208. Arcyria nutans (Bull.) Grev. Hidden Forest, July 27, 1940. Coll. by *D. H. Linder;* det. by D. P. Rogers.

209. Ascochyta graminicola Sacc. On leaves of *Andropogon scoparius* Michx. Manifest as small, dense punctiform pycnidia on the lower surface of the leaf-blades. Same as No. 106 except for host. August 20, 1937. Coll. and det. by *E. F. Guba.*

210. Auriscalpium vulgare S. F. Gray. *Hydnum auriscalpium* L. ex. Fr. On fallen cones of *Pinus rigida* Mill. State Pines south of Fair Grounds. Sept. 5, 1939. Coll. and det. by *J. E. Lange.*

211. Belonium eustegiaeforme (B. & C.) Sacc. On *Spartina pectinata* Link. Long Pond near Madaket Rd. May 30, 1936. Coll. by *E. F. Guba;* det. by E. K. Cash.

212. Boletus versipellis Fr. Growing in mat of *Arctostaphylos,* Saul's Hills, about ½ mile west of Altar Rock. October 11, 1940. Coll. by *E. V. Seeler, Jr.;* det. by Walter H. Snell.

213. Calodon **alboniger** (Peck) Seeler, n. comb. *Hydnum albonigrum* Peck. Rept. N. Y. State Mus. Nat. Hist. **50:** 110, 1897. *Phellodon alboniger* Banker. Mem. Torr. Bot. Club **12:** 167, 1906. In mat of needles of *Pinus rigida* Mill. State

Pines south of Fair Grounds, Aug. 7, 1938. Coll. and det. by *E. V. Seeler, Jr.*

214. CALODON VELUTINUM (Fr.) Quélet. *Hydnum velutinum* Fr. In mat of needles of *Pinus rigida* Mill. State Pines south of Fair Grounds, Oct. 23, 1938. Coll. and det. by *E. V. Seeler, Jr.*

215. CANTHARELLUS AURANTIACUS (Wulf. ex Fr.) Fr. In mat of needles of *Pinus strobus* L. State Pines south of Fair Grounds, Sept. 2, 1940. Coll. and det. by *E. V. Seeler, Jr.*

216. CANTHARELLUS CIBARIUS Fr. On ground, Hidden Forest, Aug. 5, 1938. Coll. by *K. S. Seeler;* det. by E. V. Seeler, Jr.

217. CANTHARELLUS CINNABARINUS Schw. On ground, Hidden Forest, July 31, 1938. Coll. by *E. V. Seeler, Jr.;* det. by D. H. Linder.

218. CERATIOMYXA FRUTICULOSA (Muell.) Macbride. Hidden Forest, July 27, 1940. Coll. and det. by *D. H. Linder.*

219. CHRYSOMYXA CASSANDRAE Tranzschel. *C. cassandrae* (P. & C.) Tranz. in Arthur. On *Chamaedaphne calyculata* (L.) Moench. Siasconset road swamp, Aug. 28, 1940. Coll. and det. by *M. A. Rice.*

220. CLAVARIA CRISTATA (Holmsk.) Pers. In mat of pine needles. State Pines south of Fair Grounds, July 25, 1940. Coll. and det. by *D. H. Linder.*

221. *COLLYBIA DRYOPHILA (Bull.) Fr.

222. COLLYBIA LACERATA (Lasch ex Fr.) Fr. On dead roots of *Pinus* sp. near soil surface. State Pines south of Fair Grounds, Aug. 11, 1940. Coll. by *K. S. Seeler;* det. by R. Singer.

223. *CORDYCEPS MILITARIS Link.

224. CORTINARIUS TORVUS Fr. Hidden Forest, Aug. 5, 1938. Coll. and det. by *E. F. Seeler, Jr.*

225. CRYPTOPORUS VOLVATUS (Peck) Hubbard. *Polyporus volvatus* Peck. On trunk of dead tree of *Pinus rigida* Mill. State Pines south of Fair Grounds, July 25, 1940. Coll. by *E. V. Seeler, Jr.;* det. by D. H. Linder.

226. CYPHELLA VILLOSA (Pers. ex Fr.) Karsten. On dead parts of beach grass, *Ammophila breviligulata* Fern. North Shore sand dunes just west of Nantucket Golf Course. Sept. 5, 1939. Coll. and det. by *E. V. Seeler, Jr.*

227. DAEDALIA UNICOLOR Fr. On dead *Acer rubrum* L. Hidden Forest, May 29, 1939. Coll. by *E. V. Seeler, Jr.;* det. by D. H. Linder.

228. DIATRYPELLA EUTYPOIDES Niessl. On dead branches of *Ulmus americana* L. Brant Point, Apr. 23, 1939. Coll. by *E. V. Seeler, Jr.;* det. by L. E. Wehmeyer.

229. DINEMASPORIUM GRAMINEUM Lév. On leaves of *Andropogon scoparius* Michx. Aug. 20, 1937. Coll. and det. by *E. F. Guba.*

230. Eccilia rhodocylix (Lasch ex Fr.) Fr. On ground under *Quercus velutina* Lam. State Pines south of Fair Grounds, Sept. 5, 1939. Coll. by *E. V. Seeler, Jr.;* det. by J. E. Lange.

231. Entoloma strictius Peck. On mat of pine needles, State Pines south of Fair Grounds, Sept. 2, 1939. Coll. by *E. V. Seeler, Jr.;* det. by J. E. Lange.

232. Entoloma lineatum (Cke.) J. J. Davis. On leaves of *Zizania aquatica* L. Coll. by *M. A. Rice;* det. by W. W. Diehl.

233. Eurotium herbariorum (Wigg.) Link. On pressed leaves and stems of *Rubus* with *Gymnoconia Peckiana* (Howe ex. Peck) Trotter. June 27, 1940. Coll. by *M. A. Rice;* det. by D. H. Linder.

234. Exidia glandulosa (Bull.) Fr. On fallen branch, Hidden Forest. July 27, 1940. Coll. and det. by *D. H. Linder.*

235. Flammula penetrans Fr. On stumps of *Pinus* sp., common in the fall. State Pines south of Fair Grounds, Sept. 5, 1939, and often since. Coll. by *E. V. Seeler, Jr.;* det. by J. E. Lange.

236. Fomes annosus (Fr.) Cooke. On stump of *Pinus rigida* Mill. State Pines south of Fair Grounds, Aug. 11, 1938. Coll. by *E. V. Seeler, Jr.;* det. by D. P. Rogers.

237. *Galera hypnorum Fr.

238. Gloeosporium polygoni Dearn. & House. On living leaves of *Polygonum persicaria* L. with *Septoria polygonorum* Desm. In cultivated field along Hummock Rd. Aug. 17, 1936. Coll. and det. by *E. F. Guba.*

239. Helotium scutula (Pers. ex Fr.) Karsten. On fallen twig, swamp near Ram pasture. Coll. by *M. A. Rice;* det. by W. L. White.

240. Hymenochaeta corrugata (Fr.) Lév. On dead branch of *Acer rubrum* L. Hidden Forest (1) May 30, 1936. Coll. by *E. F. Guba;* det. by W. W. Diehl. (2) July 27, 1940. Coll. by *D. H. Linder;* det. by W. L. White and D. P. Rogers.

241. Hymenochaeta tabacina Sowerby ex Lév. On fallen branch, Hidden Forest, Oct. 11, 1940. Coll. by *E. V. Seeler, Jr.;* det. by D. P. Rogers.

242. *Hypholoma candolleanum Fr.

243. Hysterium pulicare Pers. On bark of *Cornus florida* L., Hidden Forest, May 30, 1936. Coll. by *E. F. Guba;* det. by E. K. Cash.

244. Hysterographium praelongum (Schw.) E. & E. On dead branch of *Ulmus americana* L. on living tree. Brant Point, Apr. 23, 1939. Coll. and det. by *E. V. Seeler, Jr.*

245. Hysterographium vulvatum (Schw.) Sacc. On twigs of *Sassafras variifolium* (Salisb.) Kuntze, Hidden Forest, May 31, 1936. Coll. by *E. F. Guba;* det. by E. K. Cash.

246. Kunkelia nitens (Schw.) Arth. III. On *Rubus* sp. Old Dump, Nantucket, July 3, 1940. Coll. and det. by *M. A. Rice.* Short cycle by germination. See No. 39 for long cycle.

247. Laccaria laccata (Scop. ex Fr.) Berk. & Br. Growing in mat of pine needles, State Pines south of Fair Grounds, Sept. 16, 1940. Coll. by *K. S. Seeler;* det. by E. V. Seeler, Jr.

248. Lactarius theiogalus (Bull. ex Fr.) Fr. In mat of pine needles; common. State Pines south of Fair Grounds, Sept. 5, 1939. Coll. by *E. V. Seeler, Jr.;* det. by J. E. Lange.

249. *Lepiota umbonata (Schum.) Lange.

250. *Lepiota lutea (Bolt.) Quél.

251. Lophodermium juniperinum (Fr.) de Not. (Immature). On leaves of *Juniperus virginiana* L. Siasconset Rd., May 30, 1936. Coll. by *E. F. Guba;* det. by E. K. Cash.

252. *Marasmius androsaceus (L.) Fr.

253. Melanconium typhae Pk. On dead stems of *Typha latifolia* L. Border of Long Pond near Madaket Rd. and along Miacomet Pond, May 30, 1936. Coll. by *E. F. Guba;* det. by J. A. Stevenson.

254. *Mutinus bovinus Morg.

255. *Mycena alcalina Fr.

256. Mycena sanguinolenta (Ars. ex Fr.) Fr. In mat of pine needles; common. A small delicate mushroom with red juice in the stem. State Pines south of Fair Grounds. Coll. by *E. V. Seeler, Jr.,* det. by J. E. Lange.

257. Nummularia microplaca (B. & C.) Cke. On dead branches of *Sassafras variifolium* (Salisb.) Kuntze, Hidden Forest, May 1936. Coll. by *E. F. Guba;* det. by W. W. Diehl.

258. Nyctalis asterophora Fr. This is a small sturdy mushroom which grows on top of the large funnel-shaped *Russula delica* Fr. so common and pushing up patches of the pine needle mat. State Pines south of Fair Grounds, July 25, 1940. Coll. by *D. H. Linder;* det. by E. V. Seeler, Jr.

259. Panus stipticus Fr. On bark of *Quercus* sp., Coskata Woods, August 7, 1940. Coll. and det. by *E. V. Seeler, Jr.*

260. Pezicula australis Rehm. On bark of dead *Gleditsia triacanthos* L., "Harp-O-the-Winds", Wauwinet Rd., June 25, 1938. Coll. by *E. V. Seeler, Jr.;* det. by J. Walton Groves. (This determination is tentative until the fungus can be grown in culture as this is a new host.)

261. Phaeobulgaria inquinans (P. ex Fr.) Seaver. *Bulgaria polymorpha* (Oeder ex Fr.) Wettstein. In logs of *Quercus* sp. shipped from Mattapoisett, Mass., Steamboat Wharf and Island Service Co. yard, Aug. 16, 1937. Coll. and det. by *E. V. Seeler, Jr.*

262. Phyllachora graminis (P. ex Fr.) Fckl. On stems and leaves of *Ammophila breviligulata* Fernald (see Nos. 160 and 161),

south end of Madaket Rd., May 30, 1936. Coll. and det. by *E. F. Guba.*

263. Phyllachora graminis (P. ex Fr.) Fckl. On *Andropogon virginicus* L. in field at Polpis, Sept. 29, 1936. Coll. and det. by *E. F. Guba.*

264. Phyllachora graminis (P. ex Fr.) Fckl. with *Puccinia peridermispora* (Ellis & Tr.) Arth. On *Spartina alterniflora* Loisel. var. *glabra* (Muhl.) Fern., Long Pond Shore near ocean, August, 1940. Coll. by *M. A. Rice;* det. by E. F. Guba.

265. Phyllachora trifolii (P. ex Fr.) Fckl. On living leaves of *Trifolium hybridum* L. Waste places, Siasconset, August 18, 1936. Coll. and det. by *E. F. Guba.*

266. Phyllostictina pallidior (Pk.) Petrak & Syd. On leaves of *Smilacina stellata* (L.) Desf., Coatue, Aug. 1940. Coll. by *M. A. Rice;* det. by E. F. Guba.

267. Phragmidium speciosum (Fr.) Cke. On living leaves of *Rosa virginiana* Mill. Madaket. June 25, 1936. Coll. by *G. Wyatt;* det. by E. F. Guba.

268. Polyporus hirsutus (Wulf.) Fr. On dead branches of *Myrica carolinensis* Mill. Hummock Rd., May 30, 1936. Coll. by *E. F. Guba;* det. by W. W. Diehl.

269. *Pluteus cervinus (Schaeff.) Fr.

270. *Psathyra fibrillosa (Pers.) Fr.

271. *Psilocybe elongata (Pers.) Fr.

272. Puccinia bolleyana Saccardo O., I. On *Sambucus canadensis* L. June 24, 1940. Coll. and det. by *M. A. Rice.*

273. Puccinia caricis (Schum.) Schroet. I. On leaves of *Ribes oxyacanthoides* L. Tuckernuck Island, Aug. 14, 1940. Coll. and det. by *M. A. Rice.*

274. Puccinia convolvuli (Pers.) Cast. II, III. On *Convolvulus arvensis* L. Lily Pond Swamp, Aug. 1940. Coll. and det. by *M. A. Rice.*

275. Puccinia coronata Cda. II, III. On leaves and stems of *Avena sativa* L. See No. 173. Polpis Rd. and in field along Hummock Pond Rd. Aug. 1939. Coll. and det. by *M. A. Rice.*

276. Puccinia coronata Cda. II, III. On leaves of *Holcus lanatus* L. Sept. 1936. Coll. and det. by *E. F. Guba.*

277. Puccinia obtegens Tul. O, II, III. On *Cirsium arvense* (L.) Scop. Lily St., June 19, 1940. Coll. and det. by *M. A. Rice.*

278. Puccinia peridermispora (Ellis. & Tr.) Arth. II, III, with *Phyllachora graminis* (P. ex Fr.) Fckl. On *Spartina alterniflora* Loisel. var. *glabra* (Muhl.) Fern. Edge of Long Pond, Madaket Rd., Aug. 1936. Coll. and det. by *E. F. Guba.* Long Pond, shore near ocean, Aug. 1940. Coll. by *M. A. Rice;* det. by E. F. Guba.

279. PUCCINIA PROSERPINACAE (B. & C.) Farl. II, III. On *Proserpinaca palustris* L. Tuckernuck. Aug. 14, 1940. Coll. and det. by *M. A. Rice.*

280. PUCCINIA VIOLAE (Schum.) D. C. II, III. On *Viola blanda* Willd. Long Pond Shore, 1940. Coll. and det. by *M. A. Rice.*

281. RAMULARIA LANCEOLATA Dearn. & House. On living leaves of *Plantago lanceolata* L. Along roadside, Siasconset, Aug. 17, 1936. Coll. and det. by *E. F. Guba.*

282. *RUSSULA AERUGINEA Lindblad.

283. *RUSSULA MAIREI Singer = *R. fragilis* (Pers.) Fr.

284. *RUSSULA PARAZUREA J. Schäffer.

285. RUSSULA DELICA Fr. A very common large funnel-shaped mushroom which pushes up under the mat of pine needles. State Pines south of Fair Grounds, July 29, 1938. Coll. by *E. V. Seeler, Jr.*, det. by J. E. Lange.

286. RUSSULA FOETANS Pers. Hidden Forest, July 31, 1938. Coll. and det. by *E. V. Seeler, Jr.*

287. SCLERODERMA LYCOPERDOIDES Schw. On ground in garden, 20 Orange St., July 28, 1938. Coll. and det. by *E. V. Seeler, Jr.*

288. SELENOPHOMOPSIS JUNCEA (Mont.) Petrak. On stems of *Cytisus scoparius* Link. Madaket Rd., May 30, 1937. Coll. by *E. F. Guba;* det. by E. K. Cash. Not previously reported from the United States.

289. SEPEDONIUM CHRYSOSPERMUM (Bull.) Link ex Fr. Parasitic on *Strobilomyces strobilaceus* (Scop.) Berk. State Pines, south of Fair Grounds, Aug. 10, 1940. Coll. and det. by *E. V. Seeler, Jr.* This forms a powdery mass of golden yellow spores on decaying Boleti.

290. STEREUM OCHRACEO-FLAVUM Schw. On stems of *Myrica carolinensis* Mill. killed by fire, Madaket Rd., east of Long Pond, Aug. 30, 1937. Coll. and det. by *E. V. Seeler, Jr.*

291. SYNCHYTRIUM AUREUM Schröter. On *Hydrocotyle umbellata* L. 1940. Coll. by *M. A. Rice;* det. by D. H. Linder.

292. TRAMETES SUAVEOLENS (L.) Fr. On *Salix* sp. Hidden Forest, May 30, 1936. Coll. and det. by *I. H. Crowell.*

293. TRAMELLA LUTESCENS Pers. On dead branch of *Acer rubrum* L. Hidden Forest, July 27, 1940. Coll. by *D. H. Linder;* det. by E. V. Seeler, Jr.

294. TRICHOLOMA NUDUM (Bull. ex. Fr.) Fr. Hidden Forest, October 11, 1940. Coll. and det. by *E. V. Seeler, Jr.* A very beautiful all violet mushroom.

295. UROMYCES ACUMINATUS Arth. II, III, with *Claviceps purpurea* (Fr.) Tul. On leaves and stems of *Spartina alterniflora* Loisel. var. *pilosa* (Merr.) Fern. Oct. 1, 1936. Coll. and det. by *E. F. Guba.*

296. Uromyces **ari-triphylli** (Schw.) Seeler, n. comb. *Aecidium caladii* Schw. Schr. Nat. Ges. Leipsig **1:** 69. 1822. *Puccinia ari-triphylli* Schw. Trans. Amer. Phil. Soc. II. **4:** 297. 1834. *Uromyces caladii* (Schw.) Farl. in Arthur p. 214. The specific epithet *caladii* is invalid because it was not based on the teleutospore stage. Internat. Rules Bot. Nomen. 3 ed. Art. 57. For further synonymy see works of Farlow, Arthur and Sydow. On *Arisaema triphyllum* (L.) Schott. Abnecount's Island, Nantucket, July 6, 1940. Coll. and det. by *M. A. Rice.*

297. Uromyces fabae (Pers.) de Bary. II, III. On *Vicia sativa* L. Siasconset roadside, July 26, 1940. Coll. and det. by *M. A. Rice.*

298. Uromyces houstoniatus (Schw.) Sheldon. III. On *Sisyrinchium atlanticum* Bicknell. Quidnet, Aug. 7, 1939. Coll. and det. by *M. A. Rice.*

299. Uromyces houstoniatus (Schw.) Sheldon. O, I. On *Houstonia caerulea* L. Coleman's Bird Sanctuary, June 27, 1940. Coll. and det. by *M. A. Rice.*

300. Uromyces hyperici (Spreng.) Curt. O, I, II. On *Hypericum adpressum* Bart. Along border of pond. Aug. 1939. Coll. and det. by *M. A. Rice.* See No. 97.

301. Uromyces hyperici (Spreng.) Curt. O, I, II. On *Hypericum virginicum* L. Coll. and det. by *E. F. Guba.* Also Tuckernuck Island, Aug. 14, 1940. Coll. and det. by *M. A. Rice.*

302. Venturia inaequalis (Cke.) Aderh. On leaves and fruits of *Pyrus malus* L. Ash Street, Aug. 1940. Coll. and det. by *E. F. Guba.*

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Harvard University

CONTRIBUTION FROM THE LABORATORIES OF CRYPTOGAMIC BOTANY AND THE FARLOW HERBARIUM, HARVARD UNIVERSITY.—NO. 196

NOTES ON NEW ENGLAND ALGAE

II. Some interesting New Hampshire Algae

Roy M. Whelden

That the many and varied bodies of fresh water of New Hampshire should yield rich collections of algae may be anticipated from the frequency with which early American algologists described such plants. Often however the abundance of species and forms encountered in a single pond far surpasses one's expectations, especially when the examination is exhaustively thorough. Among ponds yielding rich returns, Downing Pond in the town of New Durham offers much of particular interest to a student of the algae. Formed at least in part by the damming of a river, raising the water level several feet, this pond covers an area of perhaps 200 acres, over the greater part of which the depth of water is not more than 10 feet. The sandy bottom of the shallower portions, overlaid with a thin layer of fine ooze, is covered with an abundance of *Potamogeton*, *Vallisneria*, *Brasenia*, *Castalia* and other plants, among which occurs an abundance of *Utricularia*. In the deeper portions there are many specimens of *Nitella flexilis* growing on a coarse gravel bottom.

Throughout the summer months all this submerged vegetation, as well as such twigs and logs as occur, are commonly thickly covered with an ooze of algae. The water itself is rich in plankton

material, which is not considered in this paper. Many of the algae persist undiminished in numbers until late in the fall and even the coldest weather of the winter does not cause all of them to disappear.

While extensive observations have been made throughout several years, the observations herein reported are based on material gathered and examined in August, then preserved by formalin and studied exhaustively as opportunity offered. They comprise considerations of several algae which differ notably from previously known material from this region or whose occurrence has been rarely cited.

The Genus Staurastrum

Desmids were very well represented in all collections made from this pond, the various genera being proportionately equally well represented. About 30 species of Staurastrum were found in large numbers, most of them being species of larger than average size for the genus. Among these, one of the most frequently encountered in all material was *Staurastrum Arctiscon* (Ehrenb.) Lund., and occurring even more abundantly than the species was the variety *truncatum* Irénée-Marie. (Fig. 4.) In the hundreds of specimens examined some slight variations were noted: by far the greater number of them were noticeably larger than those described by Irénée, the length (processes excluded) ranging from 90–122 μ (processes included, from 155–196 μ); the breadth (processes excluded) was 60–75 μ (processes included, the breadth was 133–162 μ); the breadth of the isthmus 30–42 μ. The other most noticeable variation was found in the nature of the ends of the bifurcated processes. Irénée characterizes the variety in part by the lack of spines ("pointes") at the ends of the processes. In the New Hampshire material this is equally characteristic of a great many of the specimens, but not all. Many have three well-developed acute spines 2–3 μ long at the apex of each arm of the process. The relative dimensions of the cell body and the length and amount of divergence of the processes also show considerable variation.

This variety is not infrequently encountered in other parts of New Hampshire, as well as in western Maine; but in no other station have I found it so plentiful as in the present one.

Staurastrum longispinum (Bail.) Arch. was another species found in some abundance. Among the specimens were some which differed from the type in having three equally large spines (30 μ long) in a vertical row at one, two or all three angles of a semicell. No specimens were observed in which all the angles of the cell were so armed.

The Genus Micrasterias

The genus Micrasterias is conspicuously present in nearly all collections from this pond, with *M. foliacea* Bailey the most abundant in numbers, and in filaments often nearly a millimeter long, but rather fragile and easily broken. Fifteen species have appeared in the various gatherings, most of them rather abundantly. Among the rarer ones is *M. Johnsonii* W. & G. S. West.

In 1897 the Wests described this species of *Micrasterias* from Florida. It is characterized by very deep incisions, by the occurrence of two very long spines terminating each division of the lateral lobes, by having one long straight spine from each angle of the polar lobes and by the presence of a row of very fine spines within the margins of the several lobes. The dimensions of the species were given as 270 μ long, 275 μ broad, with the apical lobe 26 μ and an isthmus 30 μ broad.

Taylor (1935) described a variety *bipapillata* from Newfoundland. This variety has shorter spines terminating the lateral lobes, is quite devoid of intramarginal spines and has two mammilate-subaculeate projections on each side of the apical margin of the polar lobe. The variety is somewhat smaller than the species, the length being 250 μ and breadth 240 μ.

Salisbury (1936) described from Florida, as *Micrasterias ranoides,* an alga quite similar to the species, but lacking intramarginal spines and having the polar lobe about one half the width of the cell. The dimensions were: length 208–269 μ; breadth 202–254 μ; thickness 45–50 μ, apex 102–108 μ and isthmus 21–23 μ broad. Krieger (1939) reduced this to variety *ranoides* of *M. Johnsonii.*

To these there must now be added another variety which has much in common with the two above. Like them the surface of the cell lacks completely any ornamentation of intramarginal spines. Unlike them, each lateral lobe ends in two fairly stout

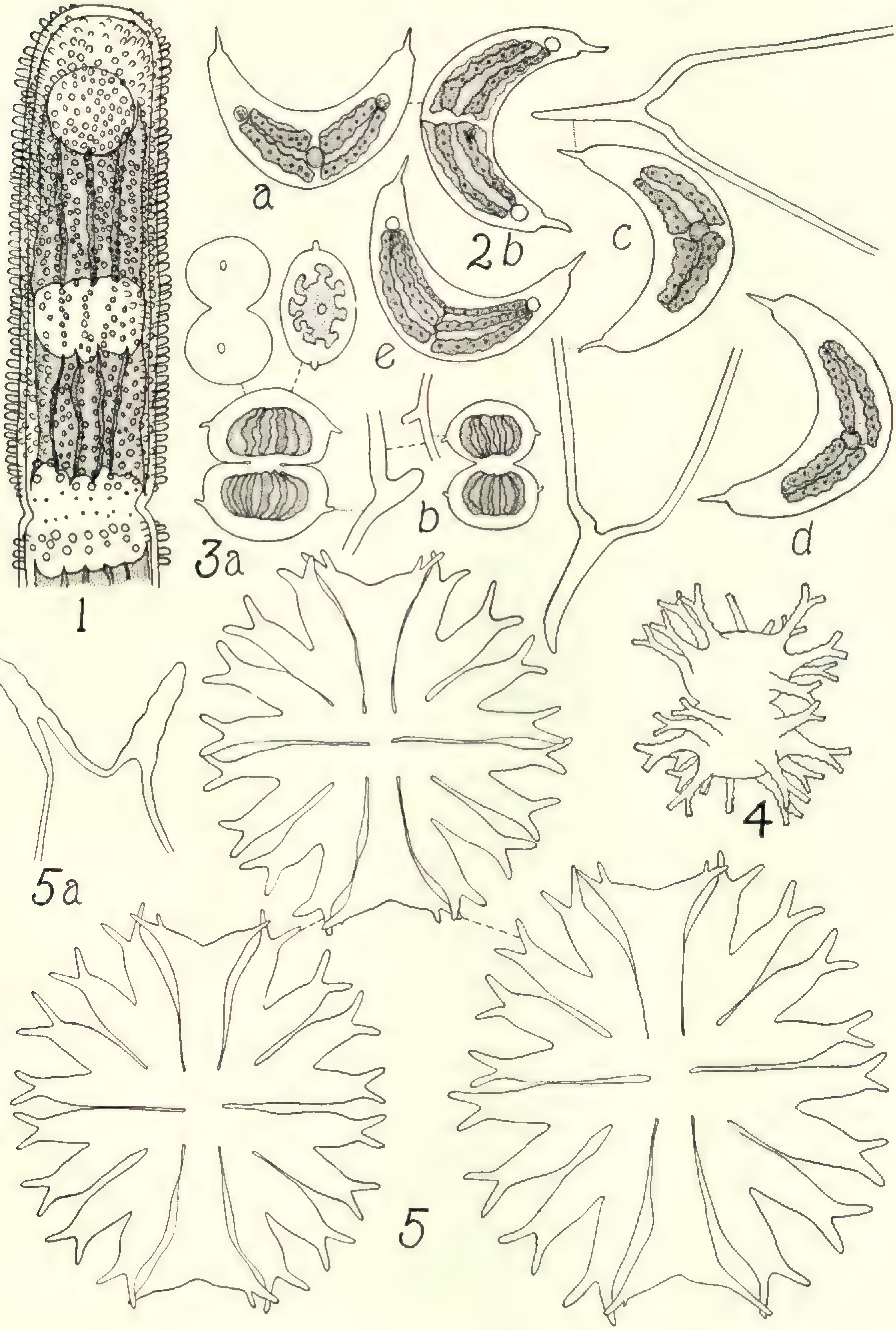
and usually rather blunt spines that are 17–25 μ long and strongly diverging. The polar lobe is broadly obcuneate, widening rapidly in its distal third to a breadth of 90–115 μ. The apical margin of this lobe is usually quite deeply indented in the middle. The exterior angle of the polar lobe ends in a long coarse spine; near this, on the apical margin there is a second spine which may be equal in size to that of the regular spine, but is often much smaller and may be completely missing in one or both the angles of one or both polar lobes. In some specimens the surface of the spines and even of the adjacent part of the lobe is gently and irregularly undulate. (Fig. 5a).

In size this variety varies somewhat, but is generally somewhat larger than any of the previously named forms. I describe this as:

Micrasterias Johnsonii, var. **novae-angliae,** var. nov. Fig. 5. Differt a typo membrana sine spinis, et apicibus lob. polaris spinis uno vel duobus acutis armatis. Cellulis 280–348 μ long., 270–323 μ lat.; isthmo 19–30 μ lat., lob. polaribus 93–116 μ lat.

The Genus Cosmarium

Considering the large number of described species of *Cosmarium,* the genus appears to be very poorly represented in this pond, only two dozen species having so far been found in any quantity. Of these, *C. ovale* Ralfs, C. *Eloiseanum* Wolle, C. *Quinarium* Lund. & C. *margaritatum* (Lund.) Roy and Biss. are most frequent. Equally abundant and rather more interesting are the frequently encountered specimens of *Cosmarium contractum* var. *papillatum* W. & G. S. West. In the New Hampshire specimens however the cells, while very variable in size, have all much larger dimensions than given by others, having cell length 90–123 μ, cell breadth (without papillae) 62–96 μ; cell thickness 48–55 μ; breadth of isthmus, 19.5–26 μ; length of papillae 2–8 μ. Cell dimensions given by others are: length 73 μ; breadth 51 μ; thickness 44 μ, breadth of isthmus 20 μ, length of papillae 2–3 μ. (Fig. 3, a & b).


a
2b
c
e
3a
b
d
1
4
5a
5

The Genus Spinoclosterium

Spinoclosterium curvatum Bernard. [*Closterioides spinosus Prescott.*]

In 1909 Charles Bernard described an alga collected in large ponds in the botanic garden at Singapore. He placed it in the new genus *Spinoclosterium*, close to *Closterium*, but readily distinguished from the latter by the presence of a single large spine terminating each apex of the cell. In all other details the plant is like *Closterium*, having a smooth wall, distinct large vacuoles containing several granules each, and a single large chloroplastid in each semi-cell. The plastid seemed to have six radiating bands, with many pyrenoids apparently serially distributed in the bands. His species, designated *curvatum*, measured 120–144 μ between apices, 150–170 μ along the concave, and 240–275 μ along the convex side. It was 47–52 μ broad, with apical spines 15–24 μ long and 5–7 μ broad at base. The spines were quite noticeably curved.

In 1937 Prescott, presumably unaware of Bernard's paper, recorded as *Closterioides spinosus* certain Closterium-like algae from Michigan. His species was distinguished by a smooth colorless cell wall, cells slightly attenuated to broadly rounded poles, each of which bears a single stout spine. There are two plastids per cell, each with 2–3 longitudinal regions showing pyrenoids in 3 or 4 irregular series; the cells measured 140–148 μ between apices, were 58–62 μ broad, and had spines 4.5 11.5 μ long. Subsequently Prescott, (1940) having seen living cells, considered them sufficiently distinct to warrant separation from *Closterium*, and very close to Bernard's *Spinoclosterium curvatum*. Since his plants are slightly stouter, bear stouter and longer spines, and have a distinct swelling of the apices, he separates them as *Spinoclosterium curvatum* var. *spinosum*. It is quite probable that this alga is not quite so rare as the infrequency with which it has been observed would suggest. I have seen many specimens collected from a marshy pond in Maine. There many of them were infected with a small fungus which had completely destroyed all normal cell content: those which escaped infection were so densely packed with food reserves as to obscure quite thoroughly the plastid structure. In the New Hampshire col-

lections on which this report is based *Spinoclosterium* cells are not truly rare. However it is evident that they occur either singly or at most in small groups of two or three individuals and so may be easily overlooked unless systematic search is made. Then they turn up frequently.

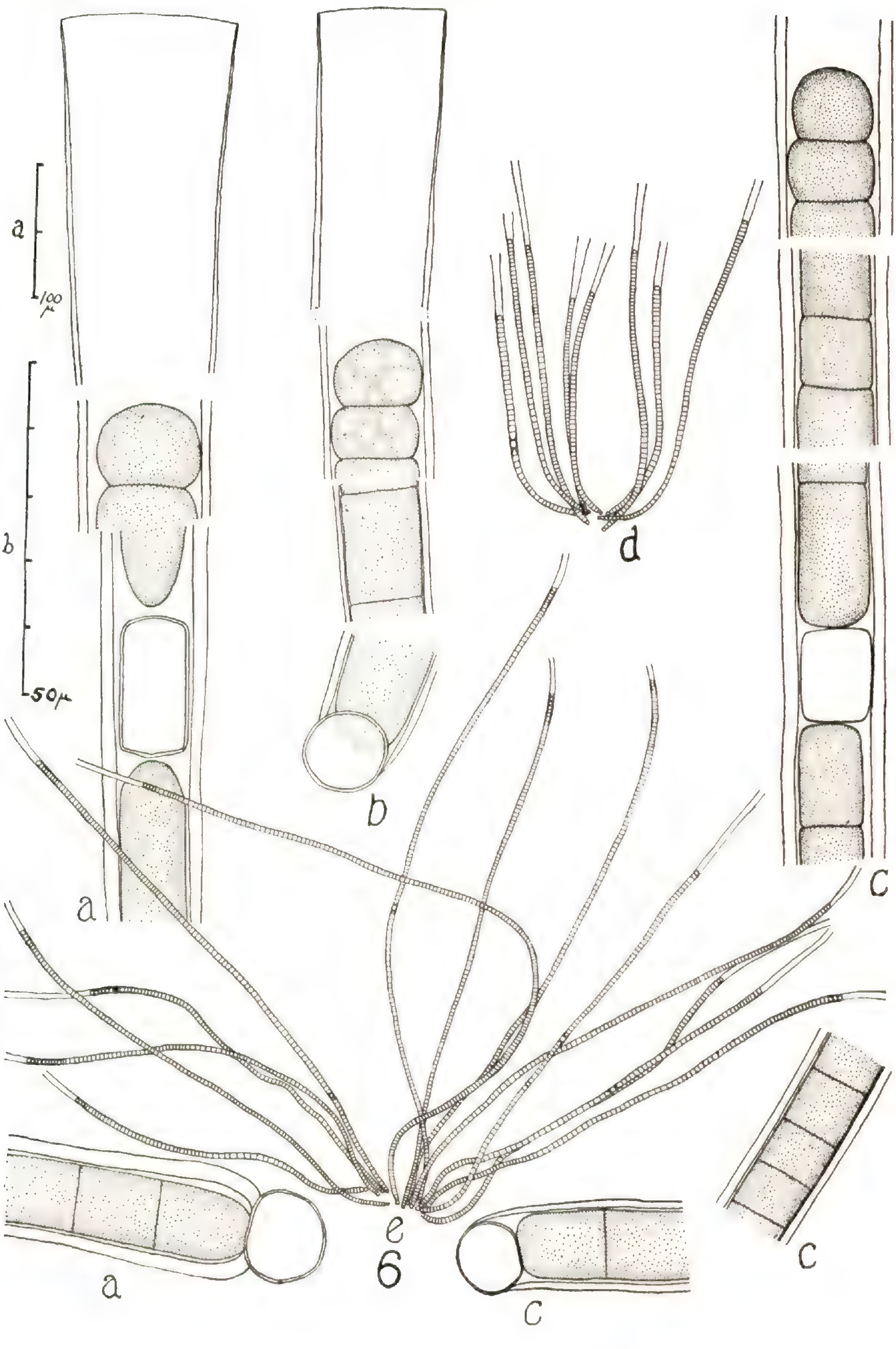
All those seen have been very strongly curved, the outer margin much more so than the inner. Tapering is very gradual from the center of the cell to a point a few microns from the apex, at which point a very abrupt narrowing occurs, culminating at the base of the spine. In some specimens there is a slight bulging of the outer margin of the cell just before this contraction point, causing the cell to appear distinctly swollen at this point (Fig. 2a). This swelling may appear only at one end of a cell, or at both, and is frequently entirely lacking. The strong spine which terminates the cell end is usually quite straight (Figs. 2a, d, e) although specimens having one (Fig. 2c) or both spines (Fig. 2b) quite distinctly curved outward are not rare.

The chloroplastids are composed of five longitudinal plates each having a row of 6–10 pyrenoids. A large vacuole is present at each end of the cell, but in only a few of my specimens (all from preserved material) was there any indication of granules within the vacuole. In these there were 10–14 small granules present.

All specimens were quite uniform in size, measuring 144–160 μ between the apices of the spines, 54–61 μ in diameter at the broadest part and having spines 17–20 μ long. Fig. 2.

The Genus Penium

Specimens of the genus *Penium* are not common in this station: *P. spirostriolatum* Barker and *P. margaritaceum* (Ehrenb.) Bréb. are found infrequently, and *P. rufescens* Cleve rarely. One which occurs quite rarely seems best considered a variety of *P. margaritaceum*, characterized by the presence of many papillae over the entire surface of the cell excepting a narrow band at the isthmus, and the central portion of the apical surface. These papillae are 2–3.5 μ long, and arranged either irregularly or less frequently in vaguely delineated longitudinal rows. I designate these plants as:


a
100 μ
b
50 μ
a
b
c
d
e
6
a
c
c

Penium margaritaceum (Ehrenb.) Bréb. var. **papilliferum,** var. nov. Penium membrana papillifera, papillis irregulariter dispersis vel lineis ordinatis; cell. 150 μ long.; Papillis 2–3.5 μ longit. Fig. 1.

Microchaete vs. Leptobasis

The blue-green algae are found in wide variety in this pond, but usually only in rather small numbers. Periodically exceptions occur, some form becoming extremely abundant for a short time, as occurs during the last two or three weeks of August, or early September, when *Nostoc planctonicum* becomes a dominant and conspicuous plant in the upper 2–3 feet of water.

Among those species which appear to occur regularly but never in any quantity is a species of *Microchaete* which seems worthy of some comment. All specimens that were observed were growing on the submerged stems or leaf sheaths of various phanenogams; the lower part of the filament of the *Microchaete* being usually, but not invariably, close pressed thereto. They are found in small groups composed of 3–16 filaments, the free ends of which may stand erect and nearly parallel, (Fig. 6d) or may spread in a group of widely divergent strands, (Fig. 6e) mostly 300–600 μ long, but infrequently reaching more than 1 mm. Each trichome is surrounded by a firm colorless sheath 1.3–2.0 μ thick in its thickest part. As a rule the sheaths are unstratified, but several groups of filaments were observed in which all or nearly all of the sheaths were composed of two or three very distinct strata which faded out only towards the apex of the filament, where the sheaths became very much thinner. One of the most noticeable characteristics of the sheaths was in their dimensions. The greater number of them showed a very evident increase in diameter from the base upwards: (Fig. 6a) measurements taken at 100 μ intervals of one filament are as follows—11.5, 13, 15, 15, 17, 17, 17, 17.5, 18, 19, 22 μ. Other filaments, often in the same group as those with increasing diameters, are either isodiametric (Fig. 6c), or else may even show a slight decrease as in one case from 16.5 to 15 μ.

The trichomes likewise show considerable variation, both in dimensions and in the nature of the component cells. In the filament whose increasing dimensions are given above the corresponding dimensions of the trichome increase from a basal

9.5 μ to a maximum of 12.5 at the apex of the trichome, which ended nearly 300 μ below the end of the sheath. The dimensions of the trichome in the other sheath mentioned above decreased from 12.5 to 11.5 μ. The smallest trichome diameter measured was 7 μ, in a sheath 11 μ in diameter: this same filament was 15 μ broad at the apex, with the trichome 11.5 μ at its apex. The shape of the cells composing the trichomes varied from base to apex. The cells of the basal portion were rectangular in optical section and varied in length from 0.6–1.6 times as long as broad: in this portion of the plant there was none or only a very slight constriction of the trichome at the dissepiments. These relative dimensions might obtain nearly throughout the trichome, but in many cases the cells of the central portion were conspicuously longer, being up to 2 times as long as broad, and seldom less than 1.2 times as long: here constrictions were rarely evident. Near the apex of the trichome the cells were much shorter, 0.6–0.9 times as long as broad, and so obviously constricted that they occasionally appeared like beads (Figs. 6a, b, c). The cell contents are usually very uniformly homogeneous. In many cases however the apical cells of the filament were prominently vesiculate (Fig. 6b). In a few instances, filaments were seen in which the cells contained many small vacuoles, possibly a consequence of the condition of those cells at the time of preservation.

Heterocysts were both basal and intercalary. The basal heterocysts were mostly subspherical and 9.5 to 12.5 μ in diameter (Fig. 6a, b, c); a few were somewhat flattened, being 11–13 μ broad and 7.5–9 μ long. Intercalary heterocysts were cylindrical and 9–21 μ long (Fig. 6, a, c). No other types of cells were observed, nor was any sign of branching noted.

The identification of this plant offered certain problems. *Microchaete* comprises those algae in which a single trichome, rarely branched, is included in a distinct sheath usually homogeneous but in a few species distinctly stratified, the sheath either of uniform diameter throughout or slightly narrowed towards the apex. The filaments grow attached to various substrates, either singly or in small groups. Basal and less frequently intercalary heterocysts occur, as well as akinetes. With the genera *Aulosira* and *Hormothamnion*, *Microchaete* makes up the family Microchaetaceae.

Elenkin (1915) described the genus *Leptobasis,* the only genus in the family Leptobasaceae, characterized principally by the distinct widening of the filament towards the apex. There is also usually a distinct narrowing of the filament in the basal portion, but the greater part of the filament is of uniform diameter. Basal and rarely intercalary heterocysts occur. The separation of this family from the Microchaetaceae seems often to be a matter of some doubt. In *Leptobasis* there is one species *L. crassa* (G. S. West) Geitler, originally described by G. S. West as *Microchaete crassa.* This plant, occurring at 2600 m. in the Eastern Andes mountains, had filaments 13–16 μ broad, slightly narrowed at the base and not widened upwards, colorless unstratified sheaths, and grew in small groups of slightly bent filaments. The basal cells of the trichome were rather longer than broad, 9–10.5 μ in diameter, whereas those near the apex were 12–13 μ in diameter and rather shorter than broad. There were no constrictions at the cross walls. The spherical heterocysts were mostly basal and 9–10.5 μ in diameter. Certainly there was little which justified removing the species from *Microchaete* to a position in *Leptobasis.* Two species of *Microchaete* need now be considered. These are *M. uberrima* N. Carter, found in rice fields of India, and *M. calothrichoides* Hansgirg, in standing water in Prater in Vienna. Miss Carter's species is characterized by its filaments of uniform diameter 16–18 μ throughout, with firm brown sheath around a trichome 10–14 μ in diameter. She also describes a form *minor* with filaments 9–11 μ broad and trichomes 6.5–8 μ. This at once suggests that there may be considerable variation in size in species of this genus. *M. calothrichoides* has filaments 10–16 μ (–20 μ) broad, occurring singly or in small groups, the latter forming a dull gray-green layer of straight or bent strands. The sheaths are thick, stratified, often more or less encrusted, and colorless. Cells at the base of the filament are 6–8 μ broad and ⅓–1 times as long, with distinct constrictions at the cross-walls. The basal heterocysts are egg-shaped to elongate—ellipsoidal, 6–8 μ broad.

No other of the described species seems to approach in character the New Hampshire plant. In size it could well be placed in either species, though it tends to be distinctly larger than *M. calothrichoides:* the shape of the cells and the size and shape of

the basal heterocysts equally serve to distinguish it from this species. The most conspicuous distinction between it and *Leptobasis crassa* is found in the distinctly constricted filaments of the former. The slightly larger average dimensions of the filament and equally slightly smaller dimensions of the trichome are not sufficient to set it off. It therefore seems justifiable to identify it as *Microchaete crassa* G. S. West (= *Leptobasis crassa* (G. S. West) Geitler), while noting specifically the fact that there is a distinct increase in the diameter from base to apex in the majority of the filaments. The great variability in the form of the filaments in this species throws doubt on the basis on which *Leptobasis* is established; it is better to place its species in the genus *Microchaete*, where they may be distinguished as a subgenus. Following DeToni (Noterelle di nomenclatura algologica VIII. Terzo elenco di Missoficee omonime. 1936) this alga should be *Fremyella crassa* (G. S. West) DeToni.

Description of Figures

Fig. 1 and details of Figs. 2, 3, 5 and 6 are all drawn to scale b; All others are drawn to scale a.

1. Penium margaritaceum (Ehrenb.) Bréb. var. papilliferum, var. nov.
2. Spinoclosterium curvatum Bernard. *A*, *d* and *e* are specimens with straight spines; *b*, with both spines curved; *c*, with one curved and one straight spine.
3. Cosmarium contractum var. papillatum W. & G. S. West. *a* is a large form, *b* a small one.
4. Staurastrum Arctiscon var. truncatum Irénée-Marie.
5. Micrasterias Johnsonii W. & G. S. West var. novae-angliae, var. nov., showing variations in size and in nature of spines of apical lobe. (*5a*) Portion of apex of lateral lobe.
6. Microchaete crassa G. S. West. Habit. *a*. Portions of a filament showing considerable increase in size base to apex. *b*. Portions of a filament showing slight increase, and with cells showing vesiculate cytoplasm. *c*. Portions of filament in which diameter is nearly uniform. *d*. A small group of nearly erect filaments. *e*. A larger group of filaments, widely diverging.

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POLLINATION OF THE ERICACEAE: VI. VACCINIUM CAESPITOSUM ON MT. KATAHDIN[1]

Harvey B. Lovell

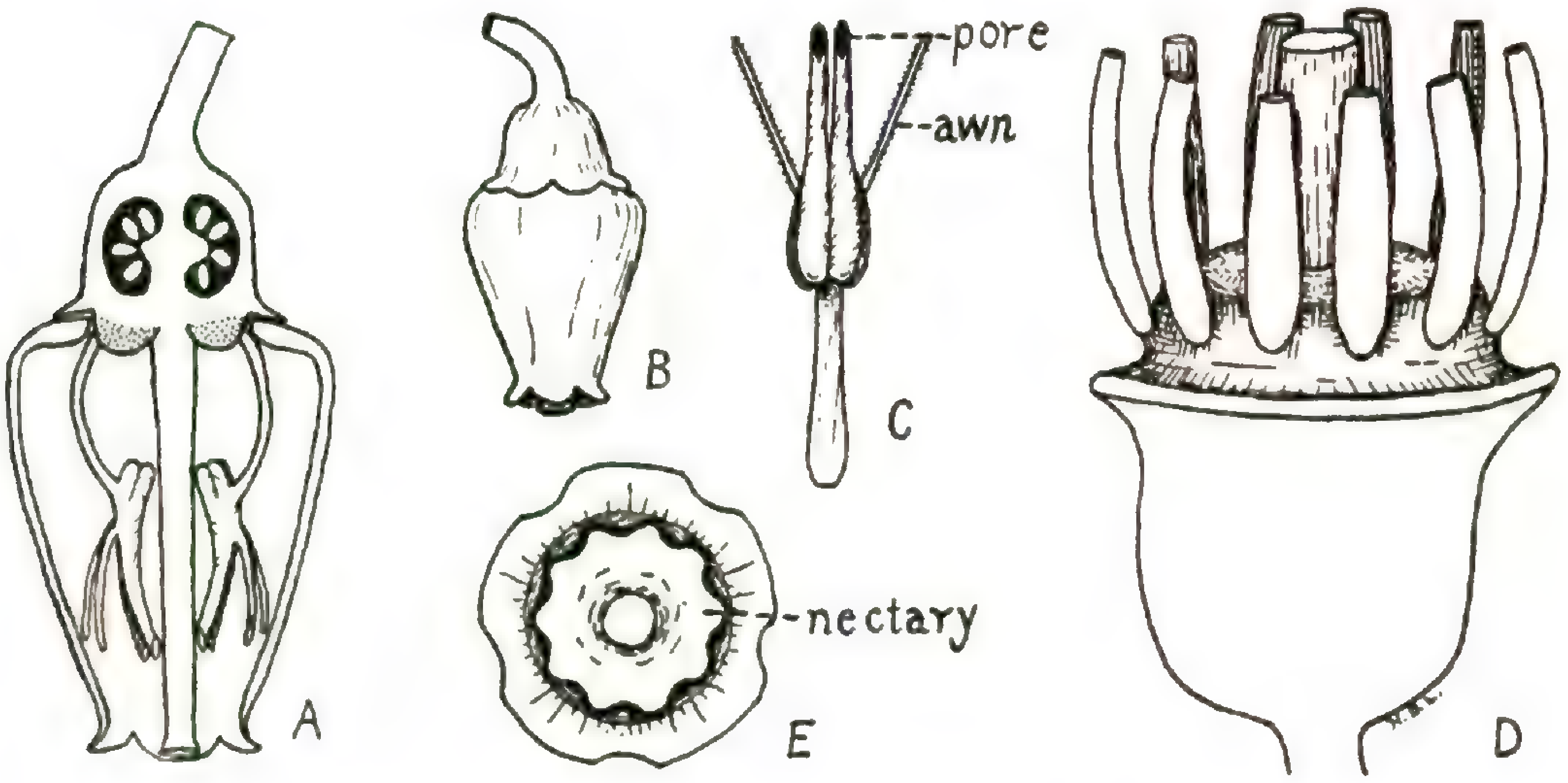
The long awns and slender anther-tubes together with the method of nectar secretion make *Vaccinium caespitosum* Michx. one of the most specialized flowers in the Heath Family. Although the related species, *V. uliginosum*, has been studied in Europe, there do not appear to be any published observations on the anthesis and insect visitors of the present species. *V. caespitosum* grows abundantly on the higher slopes of Mt. Katahdin above the tree line, where in spite of the inclement weather it sets fruit abundantly. Each leafy shoot produces a single nodding flower at the first node and the remaining leaves of the shoot almost completely conceal the flower from above. On steep slopes the side of the corolla exposed to the light is pink, whereas that next to the hillside remains white.

The five-merous flowers have a slender corolla-tube 5 to 5.5 mm. long which tapers down to 1.5 mm. in diameter at the apex. Since the stigma partially closes this opening, the nectar is rendered inaccessible to all but long-tongued insects. The corolla is very firm and tough. The capitate stigma, which stands just inside of the mouth of the flower, is very glutinous and pollen clings to it readily. Around the base of the style there is a thick, green ring, evidently the nectary, although in most cases little nectar was found on it (fig. 1, A, E), a lack which will be discussed later. Inserted on the margin of the nectary and base of the corolla are the ten stamens. In many flowers the corolla fell off leaving the stamens still attached to the

[1] Contribution from the Biology Department, University of Louisville.

nectary (FIG. 1, D). Each stamen consists of a slender hairless filament and an anther which terminates in a pair of long slender tubes (FIG. 1, C). Each tube opens by an oblique pore which rests against the style in such a way that the pollen is retained until the tube is displaced. From the back of each anther a pair of long slender awns extend nearly to the corolla-tube. The surfaces of the awns are minutely roughened.

A great deal of nectar was found between the filaments and the base of the corolla. Some of the flowers were a third full of the liquid which was clearly visible through the translucent corolla. The nectar is secreted by the margin of the nectary and escapes between the bases of the filaments, a condition similar to that



found in *V. Myrtillus* L. of Europe and in *V. uliginosum.* This position of the nectar is correlated with the hairless filaments and the presence of awns. In *V. Vitis-idaea*, var. *minor*, a species which lacks awns, the nectar is retained in the center of the flower by a circle of hairy filaments. The habits of the insect visitors are different in the two species. In the latter they probe between the anther tubes and the style and so release the pollen by pushing the pores away from the style. In *V. caespitosum* the awns play an important role in pollination. While sucking up nectar lying outside the filaments in an awnless flower, the tongue of a visitor would rarely displace the anther tubes. The projecting awns, however, furnish an obstruction which cannot be avoided, and when struck by an insect's tongue, are certain to pull aside the pores sufficiently to release the pollen. When

such an insect with its mouth parts dusted with pollen visits another flower, these organs strike the stigma first, and thus the process of cross-pollination is completed.

It is possible that self-pollination may occur by the falling of the pollen upon the glutinous stigma, especially when the flowers are shaken by the high winds of the mountain top.

The base of the corolla is conspicuously thickened and very succulent (FIG. 1, A) suggesting that it too may secrete nectar.

Bumblebees belonging to three species were the only visitors and they are all species common in northern New England at low elevations and not, as had been hoped, Arctic forms. They were observed, however, to work under conditions of high wind and dense fog which would have ordinarily stopped visits. The concealed position of the flowers beneath the leaves made them difficult to approach by flying insects, bumblebees often falling on the ground and being obliged to crawl up to the flowers. When they reached a flower, they seized it roughly with their anterior legs, thrust in their tongue and pivoted around the flower upside down. Many of the flowers had their tips chewed off by the bumblebees, a mutilation which probably did not seriously interfere with pollination. The exceptionally abundant nectar proved ample attraction, and the flowers were visited repeatedly, especially by *Bombus terricola*.

The following insects were collected on Mt. Katahdin, Maine, at altitudes of 4200 to 4600 feet from July 14 to 16, 1937, and on July 27, 1941, all sucking nectar.

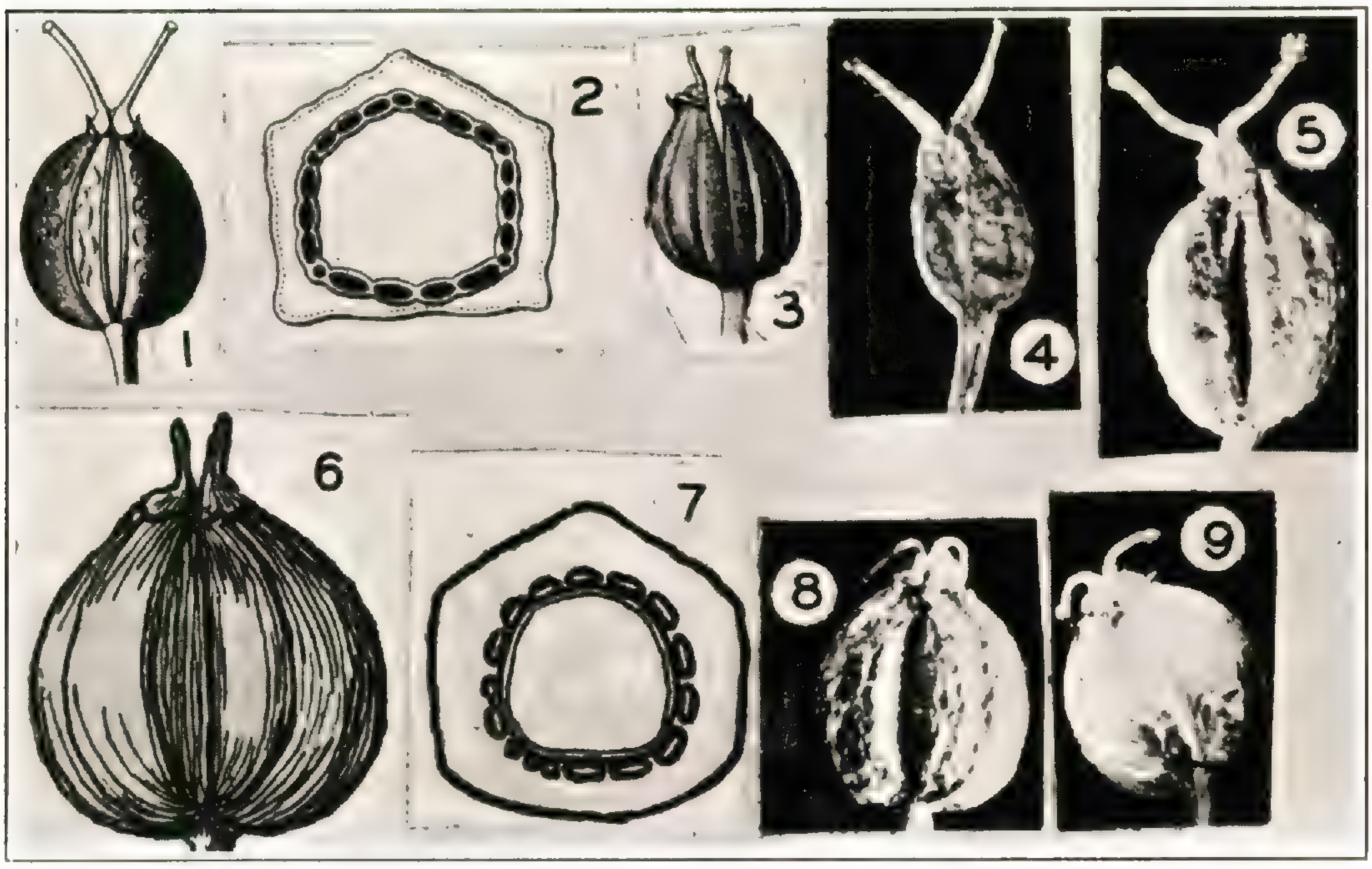
HYMENOPTERA. Apoidea. *Bombus terricola* Kirby 9 ☿; *B. vagans* Sm. 1 ☿; *B. ternarius* Say 3 ☿.

LOUISVILLE, KENTUCKY.

BERULA **pusilla** (Nutt.), comb. nov. *Sium pusillum* Nutt. in Torr. & Gray, Fl. N. Am. i. 611 (1840). *S.* ? *incisum* Torrey in Fremont, Rep. Expl. Rocky Mts. 90 (1845). *S. angustifolium* sensu Am. auth., not L. *B. augustifolia* sensu Am. auth., not Mert. & Koch. *B. erecta* sensu Coville in Contrib. U. S. Nat. Herb. iv. 115 (1893), not *Sium erectum* Hudson, basinym. *S. Novae-Mexicae* Koso-Poljansky in Bull. Soc. Nat. Moscou, n. s. xxvii. 173 (1915).

The North American plant has generally been treated as specifically identical with the Eurasian *Berula erecta* (Huds.)

Coville (*Sium erectum* Huds., *S. angustifolium* L., *B. angustifolia* (L.) Mert. & Koch). Our plant, however, has the calyx-lobes obsolete, the Eurasian plant with them evident; the styles very short and generally recurved, in the Eurasian plant prolonged and ascending; and the mericarps scarcely angled, in the Eurasian 5-angled. As pointed out by H. Wolff in Engler, Pflanzenr. iv^{228}. 339 (1927), the leaflets of the American plant average smaller and more incised, and the umbels smaller than in the Eurasian specimens. The differences in fruit and development of calyx-lobes and styles are shown in FIGS. 1–9, FIGS. 1–5 of



Eurasian *B. erecta,* FIGS. 6–9 of *B. pusilla.* FIGS. 1 and 2 are after Reichenbach, Ic. Fl. Germ. xxi. t. mdccclxxviii. figs. 7 and 9; FIG. 3 after Hegi, Ill. Fl. Mittel-Eur. v^2, t. 198, fig. 3b (1926); FIG. 4, young fruit, × 10, from *Seringe,* Herb. Helv., no. 2384; FIG. 5, fruit, × 10, from Genève, *Reuter.* Of FIGS. 6–9, showing fruits of *B. pusilla,* FIGS. 6 and 7 are after Koso-Poljansky; FIG. 8, mature fruit, × 10, from Guadalupe Mts., Texas, *Havard,* no. 237; FIG. 9, × 10, from Los Angeles, California, July, 1879, *Nevin.*

The many contrasts, including the more lacerate and smaller leaflets of *B. pusilla,* are well brought out by Koso-Poljansky; unfortunately, he did not know of the two earlier and quite

available specific names and conferred a very unusual new one. I am indebted to Dr. Wittrock for the loan of Nuttall's type of *Sium pusillum*, preserved at the New York Botanical Garden.—M. L. Fernald.

TWO FERNS NEW TO VIRGINIA

Carroll E. Wood, Jr.

In 1915 Fernald gave the range of *Botrychium lanceolatum* (Gmel.) Ångstroem var. *angustisegmentum* Pease & Moore as extending from the St. John Valley, New Brunswick, to eastern and southern Ontario, Ohio, Pennsylvania, and New Jersey, with the greatest development of the plant from Maine to central New York.[1] More recently, Wherry reported the plant as ranging south to Essex County, N. J., Chester and Lancaster Counties, Pa., and Randolph County, West Virginia.[2] Brooks included in his *Pteridophytes of West Virginia* both the Randolph County locality where a single specimen was found on Cheat Mountain (alt. 4000′) by Mr. Russell West and an additional station discovered by Dr. P. D. Strausbaugh near Green Bank in Pocahontas County.[3] Apparently these last two occurrences are the most southerly heretofore recorded, the fern presumably never having been found before in Virginia.

The discovery of a colony at an altitude of approximately 3800′ near Mountain Lake, Giles County, Virginia, is of interest, therefore, both as a range extension southwest along the Alleghenies (about 75 miles) and as an addition to the flora of Virginia. On August 11, 1941, ten plants were found growing in humus-rich shaly soil (pH 5.9 as determined by the glass electrode method) in cool maple-birch woods in the ravine of Doe Creek about ½ mile southwest of Mountain Lake Post Office. Although individual plants exhibited considerable variation in size (7–17 cm.) all were in fruiting condition. The plants all agree closely with more northern specimens and with the Pocahontas County specimen which Dr. Earl L. Core very kindly sent for comparison from the Herbarium of the University

[1] Fernald, Rhodora 17: 87 (1915)
[2] Wherry, Guide to Eastern Ferns, p. 25 (1937)
[3] Brooks and Margolin, Pteridophytes of West Virginia, p. 11 (1938)

of West Virginia. Nearby were found the other *Botrychium* species of the region (*B. dissectum* Spreng., *B. dissectum* var. *obliquum* (Muhl.) Clute, and *B. virginianum* (L.) Sw.). Unfortunately, the stand of *B. lanceolatum* is threatened by local lumbering operations and washing of the Martinsburg shale which is already encroaching on the small area occupied by the plants. The presence of *Dryopteris Goldiana* (Hook.) A. Gray farther down the ravine should be noted as a new county record.

Cystopteris fragilis (L.) Bernh. var. *genuina* Bernouilli is known chiefly as a circumboreal plant which in eastern North America occurs in Pennsylvania as far south as Somerset and Fayette Counties and then reappears in the high mountains of North Carolina.[1] On August 26, 1941, specimens of *C. fragilis* were collected from a dripping granitic cliff at an altitude of over 5000 feet on the north slope of White Top Mountain just below the spruce "cap" in Washington County, Virginia. Subsequent examination of these specimens by Dr. E. T. Wherry shows them to be the variety *genuina*, previously unknown from Virginia, but to be expected on the high mountains along the North Carolina and Tennessee borders.

Specimens of *B. lanceolatum* var. *angustisegmentum* from Mountain Lake will be placed in the herbaria of the Academy of Natural Sciences of Philadelphia, University of Pennsylvania, Virginia Polytechnic Institute, and Mountain Lake Biological Station as *Wood no. 1377*. The *C. fragilis* from White Top Mountain is in the herbarium of the University of Pennsylvania as *Wood no. 1391*.

University of Pennsylvania

[1] Wherry, Guide to Eastern Ferns, p. 75 (1937)

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 44. June, 1942. No. 522.

CERCIS IN NORTH AMERICA[1]

Milton Hopkins

Introduction.—In the course of investigations on the ecology and phytogeography of the Arbuckle Mountains in south-central Oklahoma I find the redbuds to be one of several genera which have given ample evidence that they are not at present clearly understood, either there or in other regions in the west and southwest. This xeric plateau of limestone outcrops with its unique flora of Texan affinities and its interesting geological formations has proved and is still proving to be an area of considerable importance botanically.

Two kinds of redbud are found in the Arbuckles in close proximity to each other. One is *Cercis canadensis*, both the typical form with slightly pubescent leaves and the glabrous form, f. *glabrifolia;* the other is *C. canadensis* var. *texensis* (*C. texensis* or *C. reniformis*). For several years I have been trying to separate these two plants on some basis other than leaf-shape but have been unable to do so. *C. canadensis* is very easily recognized both in the field and on the herbarium sheet, but the var. *texensis*, although its leaves are generally reniform in outline, frequently is so similar that complete segregation is difficult.

Because the two entities were so difficult to distinguish, I ventured to study all the living material of *Cercis* which was available. Collecting trips were made and ample specimens in all stages of development were obtained. Herbarium sheets were borrowed from the Herbarium of the Missouri Botanical Garden,

[1] Contribution from the Botanical Laboratory, University of Oklahoma, No. 65.

the Gray Herbarium, the United States National Herbarium, the Herbarium of the New York Botanical Garden, and the Herbarium of the Texas Agricultural and Mechanical College. To the curators of these herbaria I am most grateful for their kindness in permitting me to examine their material. In the citation of specimens the various herbaria are designated by the following letters: Herbarium of the Missouri Botanical Garden—(MBG); Gray Herbarium—(G); U. S. National Herbarium—(US); Herbarium of the N. Y. Botanical Garden—(NY); Herbarium of the Texas A. &. M. College—(TAM); Herbarium of the Univ. of Okla.—(OU).

Except for the Britton and Rose[1] synopsis of *Cercis* in the North American Flora, no detailed monographic work has been done on the genus.[2] Previous to their work, no study was made except the treatments in the manuals and floras and these were usually scanty and inadequate. The Californian and Texan plants were considered by many botanists to be identical although Asa Gray clearly differentiated the two. Until Britton and Rose's study the synonomy of the entire genus was confused. Even their monograph failed to designate or establish any type specimens. Inasmuch as it was necessary to study the Texas material in connection with my floristic work in the Arbuckles, it seemed wise to examine the entire genus in America from the viewpoint of a monographer and to present the results of this study in the following pages.

The genus in North America, as I interpret it, includes only two species. One of these, *C. occidentalis*, is restricted to areas west of the Rocky Mountains, chiefly to California, but also occurs locally in the neighboring states of Arizona, Utah, and Nevada. The other is *C. canadensis* with a much broader range throughout eastern and central United States and with several varieties and forms. It is impossible for me to view the genus as consisting of several species, as the previous investigators have

[1] In N. Am. Fl. 23. pt. 4. 201–202 (1930).

[2] Unless one may call the four-page discussion by Greene (in Fedde, Rep. Sp. Nov. 11. 108–111. 1912), in which he described 7 new species, a monograph. He adds: "Not that there are not more or less plain indications of several more; but I leave that work to the future, and for further investigation, now taking in hand mainly certain hitherto undescribed species belonging to the farther Southwest and West." Inasmuch as not one of the 7 new species described by Greene in this paper is now considered valid, perhaps it is fortunate that "the future" investigations were not conducted by him!

considered it, because the specific lines are essentially weak. Nor do herbarium sheets show these specific differences at all clearly. I have several sheets before me at the moment, and I cannot ascertain whether they are *C. canadensis* or the var. *texensis*. If I saw the living plant from which each was cut, I should probably be able to distinguish the two very clearly. Many keys in our manuals and floras are based, not on living specimens which illustrate so clearly the differences in external morphology, but rather on herbarium specimens which show only seldom those important characteristics that make one species taxonomically different from another.

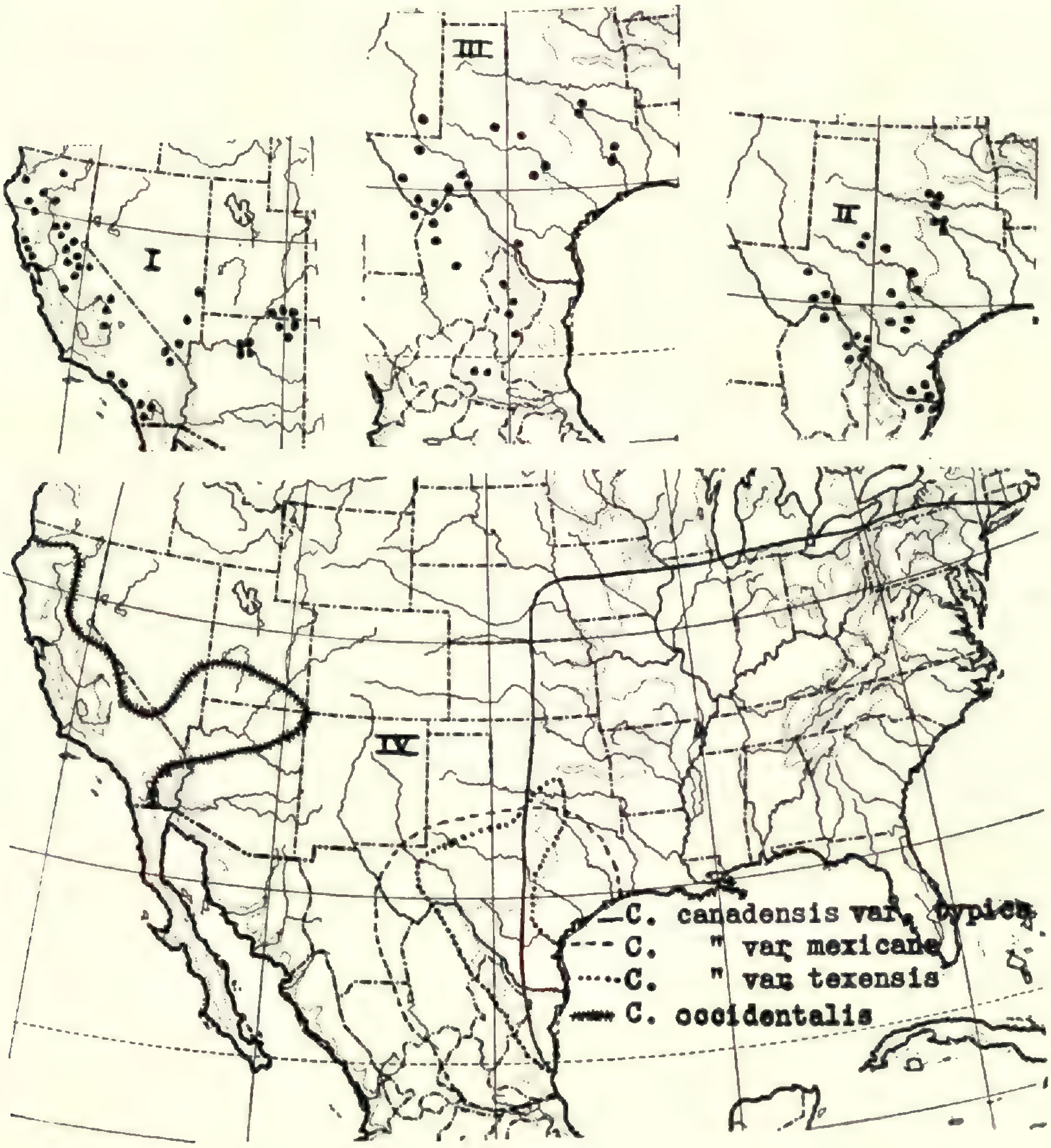
The following artificial key will help in pointing out those differences which occur among the various taxonomic units, while other notes pertaining to this treatment may be found in the discussion of each.

A. Fruit 1.8–2.5 cm. broad; petals averaging 9 mm. in length; plants of California and neighboring states..........1. *C. occidentalis*
A. Fruit 0.8–1.8 cm. broad; petals averaging 7.5 mm. or less in length; plants of Mexico, Texas, and northeastward.
  B. Mature leaves thinnish, dull green on both surfaces, generally cordate in outline, generally acute at apex.
    C. Young leaves pubescent beneath, the mature ones with a few hairs on the under surface, especially along the lower parts of the principal veins on the under surface; otherwise glabrous.................2. *C. canadensis* Var. *typica.*
    C. Leaves quite glabrous on both sides at all stages of development.....................2a. *C. canadensis* f. *glabrifolia.*
  B. Mature leaves coriaceous to subcoriaceous, rich deep green, shining, and distinctly glaucous above, reniform to cordate-reniform in outline, obtuse to emarginate at apex, often merely rounded.
    C. Pedicels and young branchlets quite glabrous at all times, leaves entirely so...........2b. *C. canadensis* Var. *texensis.*
    C. Pedicels and young branchlets densely wooly-tomentose both in youth and maturity, leaves slightly so.............................2c. *C. canadensis* Var. *mexicana.*

1. C. OCCIDENTALIS Torrey ex A. Gray. Spreading shrub forming thickets with clumps of erect, clustered stems, at maturity 2–4.5 m. high; bark light gray to grayish brown punctate with numerous whitish lenticels; stems and branchlets glabrous throughout: leaves orbicular and suborbicular to reniform, light green with yellowish or often whitish tinge, glabrous to subglaucous on both surfaces, palmately 7–9-veined, entire, subcoriaceous to coriaceous, 3–9 cm. broad, 2–5 cm. long (from apex to top of sinus); base cordate with broad (max. 3 cm.) to narrow and nearly closed (min. 3 mm.) sinus; apex retuse to emarginate or sometimes cuspidate, often merely rounded; petioles glabrous

12–35 mm. long, stipules caducous: flowers in sessile umbels or fascicles appearing in the spring before the leaves, 2–6 in each cluster, magenta pink to reddish purple; corolla obscurely papilionaceous, 8–12 mm. long; flowering pedicels 7–11 mm. long: pods abundant, oblong, flat, the upper suture with a conspicuous winged margin, 4–9 cm. long, 1.8–2.5 mm. broad at maturity, attenuate or abruptly acute at apex; fruiting pedicels divaricate to pendulous and somewhat arcuate, 10–14 mm. long; seeds orbicular, 3–4 mm. in diameter, but few mature ones in a pod.—Bost. Journ. Nat'l. Hist. (Plantae Lindheimerianae, pt. 2) **6.** 177 (1850); Jepson, Fl. W. Mid. Calif. ed. 1, 289 (1901); ed. 2, 215 (1911); Man. Fl. Pl. Calif. 511 (1925); Tidestrom, Fl. Utah & Nev. in Contr. U. S. Nat'l. Herb. **25.** 287 (1925); Britton & Rose in N. Am. Fl. **23,** pt. 4. 202 (1930); Munz, Man. s. Calif. Bot. 243 (1935); Jepson, Fl. Calif. **2.** 238 (1936). *C. californica* Torr. ex Benth., Pl. Hartw. 361 (1857). *Siliquastrum occidentale* Greene, Man. Reg. S. F. Bay 84 (1894). *C. nephrophylla* Greene in Fedde, Rep. Sp. Nov. **11.** 111 (1912). *C. orbiculata* Greene in Fedde, Rep. Sp. Nov. **11.** 111 (1912); Tidestrom in Contr. U. S. Nat'l. Herb. **25.** 287 (1925). *C. latissima* Greene in Fedde, Rep. Sp. Nov. **11.** 111 (1912). *C. occidentalis* var. *orbiculata* (Greene) Tidestr. Fl. Ariz. and N. Mex. 155 (1941).—Rocky stream-banks, canyons, hillsides and chaparral, California east to e. Arizona, w. Utah and sw. Nevada. The following are a few of the characteristic specimens. CALIFORNIA: in California, without definite locality, *Hartweg*, no. 1706 [TYPE Kew; ISOTYPE N. Y.]; "Bois rouge, frequent along streams on the upper part of the Sacramento" 8 April & 27 May 1846, *Fremont's Expedition to Calif.;* chaparral, Middle Tulare, *Purpus*, no. 5608 [MBG, G, US]; at the Geysers, Sonoma Co., *Bolander*, no. 3946 [MBG, G, US]; Cuyamaca Mts., *Edward Palmer*, no. 72 [MBG, NY]; Pleasant Valley, Napa River Basin, *Jepson*, 23 May 1897 [MBG, G]; Rumsey, Yola Co., *C. F. Baker*, no. 2935 [MBG, G, US]; California, *Fremont*, 1845–7 [MBG, G, NY]; between Cuyamaca & Oriflamme mines, San Diego Co., *Abrams*, no. 3924 [MBG, G, US, NY]; Borax Lake, *J. Torrey*, no. 108 [MBG, G, NY]; open woods, Mt. Konocti, 2000 ft., Lake Co., *Blankinship*, 17 April 1929 [MBG]; California, without locality, *Vasey*, 1875 (type of *C. nephrophylla* Greene) [US]; mountains of central Calif., *G. B. Grant*, July 1902 (type of *C. latissima* Greene) [US]. ARIZONA: without definite locality or date, *Otto Kuntze* [NY]; canyon 2 miles below Pagumpa, *M. E. Jones*, no. 5089 [MBG, US, NY]; Hermit Creek near camp, Grand Canyon, *Eastwood*, no. 6010 [G]; frequent along creek below El Tovar, Grand Canyon, alt. 3000 ft., *Hanson & Hanson*, no. A739 [MBG]; Bright Angel Trail, Grand Canyon National Park, Cocomino Co., *C. B. Wolf*, no. 3187 [G]; north slope Superstition Mts., *Goodding*, 15 May

1937 [US]; Grand Canyon, *Sturdevant,* May 1927 (as *C. arizonica* Rose, n. sp.) [US, NY]; Grand Canyon, Indian Gardens, *Goldman,* no. 2231 (as *C. arizonica*) [US, NY]. Utah: rocky cañons, Diamond Valley, *Goodding,* no. 899 (type of *C. orbiculata* Greene)



Map I, Range of Cercis occidentalis; II, of C. canadensis var. texensis; III, of C. canadensis var. mexicana; IV, areas in North America represented by species of Cercis.

[MBG, NY, US]; Red Bud Pass on Bernheimer Trail to Rainbow Bridge, San Juan Co., *H. C. Cutler,* no. 2850 [NY]. Nevada: Willow Springs, La Madre Mts., alt. 1200 m., Clark Co., *Clokey,* nos. 7978 & 7979 [G, NY]; near mountain spring, Charleston Mts., *Vernon Bailey, Coville & Funston,* no. 1883 [US]; vicinity of Kayenta, *John Wetherill,* 1922 [NY]. *Fl.* Feb.–Apr. Map I.

Because there might be some confusion as to the type specimen of *C. occidentalis* it is appropriate here to give a brief history of the name.

It was first published by Gray in Plantae Lindheimerianae thereby validating the unpublished and earlier epithet of Torrey. Gray took it up for a variety of Bentham's which was described but not named. This variety was founded on *Hartweg* no. 1706 collected in California, and this specimen must therefore be regarded as the type of *C. occidentalis*. Being in the Herbarium of the Royal Botanic Gardens, Kew, England, it cannot now be obtained, but an isotype is available at the Herbarium of the New York Botanical Garden, and it is unquestionably the California species.

However, in Plantae Lindheimerianae, no. 377, which is the plant to which Gray referred, is not the Californian species but the Texas one which in this paper I am calling *C. canadensis* var. *texensis*. This Texan plant was distinguished from the Californian one by Dr. Gray although no definite name was assigned to it. He did cite *C. reniformis* in synonomy, but this was merely a manuscript name. It seems reasonable that Lindheimer's no. 377 should become the type for my *C. canadensis* var. *texensis* instead of the type for *C. occidentalis*, as at first seems apparent. However, under the International Rules, the Hartweg plant becomes the type of the latter and no other designation is necessary or allowable.

That *C. occidentalis* is quite a distinct species from *C. canadensis* seems readily apparent to one who is familiar with the two. The western plant has pods which average much longer and broader than any other redbud and the flowers are slightly larger and more reddish in color. The shape of the leaves of this plant resembles very closely that of *C. canadensis* var. *texensis* but the average size of each leaf is smaller.

As I see it, this plant of California and neighboring states is a species with no contemporary connection, either phytogeographically or ecologically, with the eastern redbud. Further discussion on this point will be given under the heading of Phylogenetic Relationships.

Its distribution is most adequately discussed in Jepson's Flora of California and need hardly be repeated here. Arizona seems

its most eastern limit and no herbarium which I have examined has a record of its occurrence in New Mexico.

Although Rose was impressed by specimens from the Grand Canyon of the Colorado River in Arizona which seemed to differ from the typical Californian shrub, he never published his "*C. arizonica*" as a new species. He did, however, annotate several sheets with this nomen. We can assume that the annotations were made during the early part of his studies on the genus and that a more thorough examination of the material brought him to the conclusion that a distinct species or variety was not warranted.[1] With such a postulation I am in sympathy. I can see no obvious differences between the Arizona and the Californian material. Ecological conditions are sufficient to cause various modifications in the vegetative portions of the plants and it is these factors which must be taken into consideration in studying speciation in one genus over a widespread area.

The nomen "*arizonica*" unfortunately got into print in two different bulletins published by the United States National Park Service: Plants of the Grand Canyon Nat. Park by Pauline Mead Patraw, Tech. Bull. **6.** 23 (1932); and Trees of Grand Canyon Nat. Park by Natt N. Dodge, Nat. Hist. Bull. **3.** 56 (1936). Since in each case "*C. arizonica*" is a mere *nomen*, without description, the name must be discarded as invalid.

E. L. Greene was perhaps as great a "splitter" as American systematic botany has yet encountered. In *Cercis* (as in most other genera) his new species are numerous and all appear to be unsound. Careful and critical analysis reveals them to be merely

[1] There is in the Herbarium of the New York Botanical Garden an herbarium sheet on which is pasted the correspondence between Dr. W. H. Camp of that institution and Mr. W. A. Dayton, Senior Forest Ecologist, Forest Service, U. S. D. A. These letters written in 1936 pertain to the possibility of the occurrence of *C. occidentalis* in Utah, and its relation, if any, to *C. orbiculata* Greene. Camp assures Dayton that Britton & Rose considered *C. orbiculata* to be merely a synonym for *C. occidentalis* and that there is only one station for it in Utah, Diamond Valley (*L. N. Goodding*, no. 899). He goes on to say: "*Cercis occidentalis*, on the basis of our material, seems to be somewhat more common in Arizona, with specimens from Pagumpa, Kayenta, the Grand Canyon and an Otto Kuntze specimen without definite locality. According to the annotation labels, these all were put into a provisional species—'*C. arizonica*' by Dr. Rose between 1922 and 1927. The 'species,' however, was never published, and after carefully examining the Arizona specimens and the one from Utah in conjunction with the California material, including the type material seen by Torrey (which rests in our herbarium), I am of the opinion that Britton & Rose were quite justified in keeping all the material from these three states in *Cercis occidentalis* Torrey."

ecological variants in the broadest sense of the term, and by no systematist today are these species of *Cercis* considered valid. In this genus the types from which Greene described *C. latissima*, and *C. orbiculata* are not at all different from *C. occidentalis* in fundamental characters although superficially and to an untrained eye they do differ.

This species even today is frequently confused with the Texas redbuds and several manuals on California botany list its range as "east to Texas." For many years it was considered to be identical with Mexican and Texan material but Britton and Rose pointed out that *C. occidentalis* did not occur in those regions.

2. C. canadensis L., Var. **typica.** Small to large tree 7–12 m. high; trunk straight, separating into stout branches about 3 m. from the ground and forming a wide, flat head; bark dark gray to grayish brown, punctate with numerous dark gray lenticels; stems and branchlets glabrous throughout: leaves broadly ovate to ovate-cordate, dull green on both surfaces and never shining, glabrous above, more or less pubescent below or with merely tufts of hairs along the veins and midrib, palmately 7–9-veined (more frequently 7), entire, membranaceous when young, at maturity becoming thicker and somewhat subcoriaceous but never truly coriaceous, 6–15 cm. broad, 5–10 cm. long (from apex to top of sinus); base cordate to subtruncate with a broad (max. 6 cm.) or shallow (min. 1 cm.) sinus; apex acute to subacuminate or more often abruptly contracted into a short point; petioles of mature leaves glabrous, 3–5 cm. long; stipules caducous: flowers in sessile clusters appearing in the spring before the leaves, 2–6 flowers in each cluster, magenta to purplish pink; corolla obscurely papilionaceous, 6–10 mm. long; flowering pedicels 6–10 mm. long: pods numerous but not so abundant as in *C. occidentalis*, oblong, flat, the upper suture with a winged margin, 6–10 cm. long, 0.8–1.8 cm. broad at maturity, long-attenuate at apex; fruiting pedicels divaricate, reflexed or arcuate, 9–14 mm. long; seeds oblong to suborbicular, 4–5 mm. long.—*C. canadensis* L., Sp. Pl. **1.** 374 (1753); Lamarck, Dict. **2.** 586 (1783); Michaux, Fl. Bor.-Am. **1.** 265 (1803); Persoon, Synop. **1.** 454 (1807); Pursh, Fl. Am. Sept. **1.** 308 (1814); Nuttall, Gen. **1.** 283 (1818); DC., Prod. **2.** 518 (1825); Hooker, Fl. Bor.-Am. **1.** 167 (1829); T. & G., Fl. N. Am. **1.** 392 (1838); Dietrich, Synop. **2.** 1515 (1843); Chapman, Fl. s. U. S. 114 (1860); Sargent, For. Trees N. Am., 10th Census U. S. **9.** 61 (1884); Sargent, Silva N. Am. **3.** 95. tab. 133 (1892); Mohr, Pl. Life Ala. in Contr. U. S. Nat'l Herb. **6.** 555 (1901); Britton, Man. Fl. n. U. S. & Can. 529

(1901); Small, Fl. se. U. S. 584 (1903); Robinson & Fernald in Gray, Man. ed. 7. 505 (1908); Britton & Brown, Ill. Fl. ed. 2. **2.** 335 (1913); Small, Fl. se. U. S. ed. 2. 584 (1913); Sargent, Man. Trees N. Am. ed. 2. 604 (1922); Britton & Rose in N. Am. Fl. **23,** pt. 4. 202 (1930); Rydberg, Fl. Pr. & Pl. 451 (1932); Small, Man. se. Fl. 659 (1933); Stemen & Myers, Okla. Fl. 214 (1937); Steyermark, Spring Flowers of Missouri. 291 (1940); Deam, Fl. Indiana. 585 (1940). *C. canadensis* β. *pubescens* Pursh, Fl. Am. Sept. **1.** 308 (1814). *C. dilatata* Greene in Fedde, Rep. Sp. Nov. **11.** 110 (1912). *C. ellipsoidea* Greene in Fedde, Rep. Sp. Nov. **11.** 110 (1912).—Deep rich woods or in flood-plains and river thickets from Conn. w. to Iowa, south through Kans. & Okla. to Tex. and ne. Mex. The following are a few characteristic specimens. CONNECTICUT: dry woods, West Rock, New Haven, "apparently native," *E. H. Eames*, no. 11,521 [G]. PENNSYLVANIA: woods along stream tributary to Schuylkill River, w. of Shawmont, Philadelphia Co., *Fogg*, no. 11,741 [G]; streamlet tributary to Perkiomen Cr., near Arcola, Montgomery Co., *Long & St. John*, no. 2420 [G]; damp woods, Bear Creek, Allegheny Co., *J. A. Schafer*, no. 645 [G]. DELAWARE: rich woods near Centreville, *A. Commons*, 2 July 1866 [G]; Rockland, *Edw. Tatnall*, without date or number [G]. MARYLAND: moist, sandy, loamy woods along Great Bohemia Creek, Middle Neck, Cecil Co., *Long*, no. 37,303 [G]; edge of woods near Plummer Island, *Blake*, no. 9342 [G, US]. DISTRICT OF COLUMBIA: woody hillsides, vicinity of Washington, *E. S. Steele*, 20 Ap. & 15 May 1896 [G]. WEST VIRGINIA: Parkersburg, Wood Co., *W. V. U. Botanical Expedition*, 19 June 1929 [G, US]; woods near White Sulphur Springs, Greenbrier Co., *F. W. Hunnewell*, no. 2668 [G]. VIRGINIA: western slope of Bull Run Mts., Fauquier Co., *Allard*, no. 276 [G, US]; rocky wooded slope, south bank of Roanoke River, Goode's Bridge, Mecklenburg Co., *Fernald & Long*, no. 7083 [G]; Bedford Co., *A. H. Curtiss*, 10 Ap. & 1 Oct. 1871 [G]; rich wooded slope, 4 miles s. of Stony Creek, *Fernald & Long*, no. 8311 [G]. NORTH CAROLINA: Biltmore, *Biltmore Herb.*, no. 314b [G, US]; creek bank near Raleigh, Wake Co., *Godfrey*, 31 Mar. 1938 [G]. SOUTH CAROLINA: rich woodland, junction of Santee Canal and Santee River west of Pineville, Berkeley Co., *Godfrey & Tryon*, no. 1587 [G]; *S. Carolina*, ex. herb. *J. Torrey*, without date or number [G]. GEORGIA: circa urbem Augusta, *Olney & Metcalf*, no. 24 [G]. FLORIDA: Fernandina, *C. E. Faxon*, Feb. 1873 [G]; Florida, *Chapman*, without date or number [G]. MICHIGAN: up Huron River, ne. of waterworks, Ann Arbor, Washtenaw Co., *Burnham*, 6 May, 14 June 1899 [G]; primitive forest, South Haven, *L. H. Bailey*, 22 June 1880 [G]. ILLINOIS: rich woods, clay soil, Decatur, *Gleason*, no. 209 [G]; along streams, Peoria, common, *F. E. McDonald*, Ap.–July 1904 [G]; rocky

grassy slope at edge of island, Altorf Island, Kankakee Co., *Lansing & Sherff*, no. 7 [G]. Kentucky: along Cumberland River, Bell County, *T. H. Kearney*, no. 439 [G]; east of Tygarts River near Cascade Caverns in rich woods, Carter Co., *L. B. Smith, Hodgdon, et al*, no. 3493 [G]. Tennessee: edge of woods, Kingston Springs, Cheatham Co., *Svenson*, no. 48 [G]; on limestone ledge west of Whitwell, Marion Co., *E. B. Harger*, no. 7794 [G]. Alabama: woods, Troy, *G. H. Leland*, 23 Feb. 1891 [G]. Mississippi: near campus in woods, U. of Miss., *J. Wise*, 3 Mar. 1923 [OU]. Iowa: Hamburg, *Pammel*, 4 July 1914 [G]; wooded bluffs, Decatur Co., *Fitzpatrick & Fitzpatrick*, 7 May 1898 [G]. Missouri: woods, Whiteside, *John Davis*, no. 958 [G]; sparsely wooded hillsides se. Cedar Gap, Ozark Mts., *O. E. Lansing, Jr.*, no. 3075 [G]. Arkansas: creek banks and bottoms, Jasper, Newton Co., *Demaree*, no. 6378 [G]. Louisiana: Louisiana, *Dr. Carpenter, ex. herb. George Thurber*, without date or number [G]. Kansas: low woods, Riley Co., *J. B. Norton*, nos. 121 and 121a [G]; near city limits of Hays, Ellis Co., *Earl Bondy*, no. 528 [OU]. Oklahoma: river bottoms, near Idabel, McCurtain Co., *H. W. Houghton*, no. 3755 [G]; flood plain of S. Canadian River, 3 miles e. of Norman, Cleveland Co., *Hopkins & Van Valkenburgh*, no. 1205 [OU]; rich woods in Hunton Lime & Woodford Chert Formation near Mill Creek, Johnson Co., *Hopkins*, no. 4865 [OU]. Texas: woods, Corsicana, Navarro Co., *Reverchon*, 25 April 1902 [MBG]; near Houston, *Lindheimer*, 1843 [G]; Houston, *G. L. Fisher*, 10 Mar., 11 Apr. 1913 (as *C. reniformis*) [NY]; near Weatherford, *S. M. Tracy*, no. 8030 (as *C. occidentalis*) [G, US, NY]. Mexico: small tree on Hacienda Vista Hermosa, 35 miles s. of Monterrey, Nuevo Leon, *S. S. White*, no. 1538 [G]; above El Rosario, vicinity of Marmolejo, Sierra de San Carlos, Tamaulipas, *H. H. Bartlett*, no. 10855 [US]. *Fl.* Mar.–Apr. Map IV.

Our familiar redbud, which is the state tree of Oklahoma, has the mature leaves, when dry, thin in texture and very brittle on the herbarium sheets. They are invariably cordate in general outline and usually acute at the apex.

Greene's *C. ellipsoidea* appears to be merely *C. canadensis* in every detail. I have before me his type (from the United States National Herbarium), collected by J. A. Gaut in the Wichita Mountains of Oklahoma (no. 167) and it differs in no way from my conception of, nor from the available descriptions of, *C. canadensis*.

In habitat it is found more frequently in moist woods and floodplains or river thickets and even in the dry Arbuckle

Mountains one finds it most frequently in low woods in the soils of the Woodford chert formation. When it grows on soils derived from other geological formations, it will always occur on the border of one of the small streams running through the region. One concludes, therefore, that it cannot tolerate conditions which are extremely xeric.

Geographically, it extends from New Jersey south to northern Florida, west to southern Ontario, and southward through the middle prairie states to Texas and northeastern Mexico. I emphasize this broad distribution here, for I consider this species to be the one from which the other entities were derived. This point will be discussed later under Phylogenetic Relationships.

2a. C. CANADENSIS f. GLABRIFOLIA Fern. Differing from the typical form only in having the leaves quite glabrous on both surfaces.—RHODORA, **38.** 234 (1936); Steyermark, Spring Flowers Missouri. 291 (1940); Deam, Fl. Indiana. 586 (1940). *C. georgiana* Greene in Fedde, Rep. Sp. Nov. **11.** 110 (1912).—Throughout the range of the typical form.

This form seems fairly common. About one-half the specimens which I have examined have the leaves quite glabrous on both surfaces and even on the principal veins of the lower surface there is a conspicuous absence of any form of pubescence.

Greene's type of *C. georgiana* (*R. M. Harper*, no. 363, Pigeon Mt., Walker Co., Georgia, 3 Aug. 1900) illustrates such a plant but his epithet cannot be used for this form under Article 16 of the International Rules. Fernald's much more suitable name for this glabrous entity is quite valid and must stand.

Because it would add considerably to the length of this paper to cite specimens of this form, and because such citations are hardly necessary in an entity whose only difference from the typical form is the absence of pubescence, such citations have purposely been omitted.

2b. C. CANADENSIS, var. **texensis** (S. Wats.), n. comb. Tall shrub producing a clump of erect, clustered stems, more rarely tree-like, at maturity 4–10 m. high; bark light red-brown becoming gray-brown in age; stems and branchlets glabrous throughout at all times: leaves reniform to orbicular or more rarely reniform-cordate to orbicular-cordate, deep rich green becoming dark green in late summer, glabrous and very glaucous on both surfaces giving a shining, waxy appearance even when dried, palmately 7–9-veined, entire or undulate and somewhat

repand, very coriaceous, 6–15 cm. broad, 4–11 cm. long (from apex to top of sinus); base cordate with a broad (max. 3 cm.) to narrow and nearly closed (min. 4 mm.) sinus; apex acute or retuse to emarginate, rarely cuspidate and more rarely rounded; petioles of mature leaves glabrous, 2–5 cm. long, stipules caducous: flowers in sessile clusters or fascicles appearing in very early spring before the leaves, 2–6 flowers in each cluster, corolla magenta-pink, 6–10 mm. long; flowering pedicels 6–10 cm. long, 0.8–1.8 cm. broad at maturity, attenuate at apex; fruiting pedicels divaricate, reflexed or arcuate, 9–14 mm. long; seeds oblong to suborbicular, 4–5 mm. long.—*C. occidentalis* var. *texensis* S. Wats., Bibl. Index. 209 (1878). *C. occidentalis*, var., A. Gray in Bost. Journ. Nat. Hist. **6:** 177 (1850). *C. reniformis* Engelm. ex. S. Wats. in Proc. Am. Acad. **17.** 348 (1882); Coulter, Man. Phan. & Pterid. w. Tex. in Contrib. U. S. Nat'l. Herb. **2.** 91 (1891); Brit. & Rose in N. Am. Fl. **33,** pt. 4. 202 (1930); Sarg., Man. Trees N. Am. ed. 3. 604 (1933).[1] *C. texensis* Sarg. in Garden & Forest **4.** 488 (1891); and Silva of N. Am. **3.** 97 (1893). *C. nitida* Greene in Fedde, Rep. Sp. Nov. **11.** 110 (1912). *C. occidentalis* Torr. in Coulter, Man. Phan. & Pterid. w. Tex. 91 (1891) and in Small, Fl. se. U. S. eds. 1 & 2. 584 (1903; 1913), all as to plant described but not as to name.—Dry calcareous outcrops and escarpments, Arbuckle Mts. of sc. Okla., c. & w. Tex., except the Panhandle, s. to ne. Mex. The following specimens are characteristic. Oklahoma: steep slopes and gully-bottoms of xeric pasture, Viola limestone, Arbuckle Mts., *Hopkins*, no. 4768 [OU]; limestone hills, near Turner Falls State Park, Arbuckle Mts., *E. J. Palmer*, no. 42,002 (as *C. reniformis*) (US, NY, MBG); Platt National Park, Antelope Spring, *G. M. Merrill*, no. 1186 (NY); limestone bluffs, Marietta, Love Co., *E. J. Palmer*, no. 10,411 (MBG). Texas: Flora Texana exsiccata, *Lindheimer*, nos. 377 & 377b (Type in MBG; isotypes in G, US); thickets in rocky soil on the upper Guadaloupe, *Lindheimer*, no. 366 (as *C. reniformis*, n. sp. Engelm.); in deep limestone canyon near Viaduct, Valverde Co., *E. J. Palmer*, no. 33,480 (as *C. occidentalis*) (NY, US, MBG); Kerrville, Kerr Co., *A. A. Heller*, no. 1653 (as *C. occidentalis*) (NY, US, MBG); rocky hill, Austin, *Elihu Hall*, no. 165 (as *C. occidentalis*) (NY, MBG); Comanche Springs near New Braunfels etc., *Lindheimer*, nos. 752 & 753 (as *C. occidentalis*) (NY, OU, G, US, MBG); small tree in canyon-bottom, 20 miles s. of Sweetwater, Nolan

[1] Although the copyright of 1933 was obtained after Sargent's death, the Library of Congress gave the printing which followed a separate card, indicating the fact that a third edition had been published. The first one appeared in 1905, the second in 1922 and the third in 1933. But no copyright was obtained for the reprinting of the second edition in 1926. Therefore, according to the Library of Congress, this 1933 edition is the third and not the fourth, although actually four printings have been made.

Co., *G. J. Goodman*, no. 2253 (as *C. occidentalis*) (NY, OU, G, MBG); high limestone hills, Johnsville, Erath Co., *E. J. Palmer*, no. 14,205 (MBG); woods along small stream near Brownwood, Brown Co., *E. J. Palmer*, no. 26,815 (MBG); stony upland, west Dallas, *Eggert*, 23 June 1899 (MBG); Coombs Branch, Dallas Co., *Reverchon*, 10 Sept. without year (MBG); dry rocky bluffs, Station Creek, Hood Co., *Reverchon*, 5 Sept. 1903 (MBG). Mexico: Rancho Agua Dulce, moist wooded canyon on eastern slope of the Sierra de San Manuel near Muzquiz, Coahuila, *Wynd & Mueller*, no. 388 (NY). Map II.

Sargent would have been correct in taking up the name *texensis* for this calciphilous plant of Oklahoma, Texas, and northeastern Mexico had he treated it as a variety. The name *C. reniformis* was merely cited as a manuscript one by Gray as constituting a separate variety to which he actually assigned no name whatsoever. Watson later supplied the variety with the name *texensis* and referred back for its validation to Gray's description ("floribus etiam paulo minoribus, foliis supra nitidiorbus"—Bost. Journ. Nat. Hist. **6.** 177). *Texensis*, rather than *reniformis* therefore becomes the first validly published name as a variety and must be used if the plant is regarded as such. Whereas, *C. reniformis*, taken up by Watson in 1882, would be the correct name if it were regarded as a separate species. This is in accordance with Article 16 of the International Rules.

In the field this variety looks very similar to typical *C. canadensis* but differs chiefly in having the leaves thick and leathery and very glaucous. Usually the shrub can be distinguished immediately by these glistening, shining leaves. In the typical form there is no sheen to the leaves; they are merely dull green.

In the Arbuckles the two often grow in close proximity, and I know of several localities where they grow side by side. So obvious is the difference in the mature leaves that even the dullest student in my classes in systematic botany can always distinguish one from the other, when he sees them in the field.

Studies have been made from early spring continuing through late fall in an attempt to find other characters by which to distinguish this variety from the typical one. But all have failed. The flowers are similar in every way, the pods are identical and so are the seeds.

Even the leaves, in many instances, are alike. In general, var. *texensis* possesses a leaf which is reniform in shape and often

the margins will be undulate to subrepand and the apices obtuse or rounded; but the leaves may sometimes be merely broadly cordate with an acute apex. I have seen different types of leaves on the same tree. And in *C. canadensis,* although the leaves are normally cordate and acute, the mature leaves in late fall will often be broadly ovate-reniform to subcordate. The sinus at the base of the leaf might be expected to be constant, in which case reniform and cordate leaves would be easily distinguished. But with the members of this genus such constancy appears absent, and cordate leaves may have either a broad sinus (as much as 6 cm.) or a very shallow one (1 cm.). That these discrepancies may occur on the same specimen is proved by field data.

In other words, my observations seem to indicate that the shape of the leaves is, at least in *Cercis,* one of the poorest possible characters to use. Leaf-texture is about the only real difference which I see between *C. canadensis* and *C. texensis* and because of this fact, I feel that *C. texensis* must be reduced in rank from a separate species to a variety of *C. canadensis.*

This variety occurs almost exclusively on the old paleozoic limestones of northern Mexico, Texas, and the Arbuckle Mountains of Oklahoma where it is very common. No records for its occurrence in New Mexico are available and in Oklahoma it seems quite absent from the other and more youthful limestone areas in the state. In the Arbuckles one can always spot it on the driest and most exposed outcrops of pure limestone, chiefly in the Viola, Hunton, and Arbuckle formations. But, in numerous instances it grows near Honey Creek, where that small stream flows through the Viola hills, within a few feet of *C. canadensis,* which requires considerable moisture.

In general, a redbud found in the Arbuckles (at least when found in the flowering stage) is said to be *C. canadensis* if it grows on the banks of Honey Creek or in the woodland soils of the Woodford chert or Colbert Porphyry. But if it occurs on the higher, exposed, and quite dry outcrops of lime, it is said to be the var. *texensis.* Actually, *in the flowering condition one cannot tell the two plants apart* unless one knows from what location the specimen came, and even then the determination may not be foolproof. The young leaves of both are shining and only acquire

(in the case of *C. canadensis*) the dull green aspect during later months. Herbarium and field data agree perfectly in supporting this conclusion.

The above facts are mentioned with considerable embarrassment, but perhaps they will aid in making more plausible my reasons for reducing *C. texensis* in rank. When in their early stages of development two plants are so alike even in the field that they cannot be readily distinguished, it is high time that someone investigated the case more thoroughly.

Because the California plant was so long considered to be identical with this Texas-Mexican one, its distribution has been incorrectly given in many of the manuals and floras. In both editions of Small's Flora the *C. occidentalis* is this plant while in Coulter's Manual of the Phanerogams of Western Texas the *C. occidentalis* and the *C. reniformis* are both the same plant and are both merely synonyms for this variety. Likewise, in all the manuals of California botany the range of *C. occidentalis,* which is given as extending to western Texas, is inaccurate due to the fact that no differentiation was made between the two different entities.

In Sargent's Silva of North America (vol. 3) the last paragraph on page 97 reads as follows: "*Cercis texensis* was discovered by Jean Louis Berlandier at Comancheries, in the valley of the lower Rio Grande, in November, 1828." Then, in a footnote on the same page he adds: "*Cercis texensis* was named by Engelmann in MSS. *Cercis reniformis*, but was not published." This gives the impression that the type for this plant should be the Berlandier specimen, but such appears to be not the case. That herbarium sheet in the collection of the Missouri Botanical Garden bears no nomenclatorial annotation whatsoever on the original label. On the sheet itself (but not on the label) is a notation as follows: "According to Prof. Sargent this is part of probably the first collection of this species." But on the other hand, a Lindheimer specimen (no. 366) bears the annotation *on the label itself* "reniformis n. sp." which I take to be the material which Engelmann studied when he named the species. However, because this specimen had to be dug out of an herbarium, whereas Lindheimer's no. 377 is cited in a published work, it seemed best to designate the latter as the type for this variety.

2c. C. canadensis var. **mexicana** (Rose), n. comb. Similar to var. *texensis* except for the wooly tomentum on the young branchlets and petioles and for the under surface of the leaves, which is pubescent especially on the veins and midrib.—*C. mexicana* Rose in N. Am. Fl. **23,** pt. 4. 202 (1930).—Dry rocky calcareous hills, e. & c. Tex. & N. Mex., south to Mexico. The following are characteristic specimens. Texas: rocky bluffs, Brown Co., *Reverchon,* Apr. 1882 (as *C. reniformis*) (MBG, US); rocky hills, Coombs Branch, Dallas Co., *Reverchon,* no. 2998 (as *C. reniformis*) (MBG); Sanderson, Marathon Rd., 44 mi. from Marathon, Terrell Co., *Ferris & Duncan,* no. 2828 (MBG); calcareous hills near Blackwell, Nolan Co., *E. J. Palmer,* no. 34616 (as *C. reniformis*) (MBG); Sheffield, *M. E. Jones,* no. 25931 (as *C. occidentalis*) (MBG); Brewster Co., *V. L. Cory,* no. 1725 (TAM, G); common in woods near Dallas, *B. F. Bush,* no. 659 (as *C. reniformis*) (MBG, NY); Wade Canyon, Chisos Mts., Brewster Co., *O. E. Sperry,* no. 593 (as *C. reniformis*) (US); Sanderson, *C. R. Orcutt,* no. 722 (US); near Austin, *F. V. Coville,* no. 1815 (as a new species, Greene, ined.) (US). New Mexico: without locality and without date, only the notation: "Camels eat this," *Mr. Blake* [NY]. Mexico: 21 miles se. of Monclova, Caracol Mts., Coahuila, *Dr. Edward Palmer,* Sept. 1880 (as *C. reniformis*) [G]; Saltillo, *Dr. J. Gregg,* no. 107 [G]; Sierra Madre above Monterrey, Nuevo Leon, *Pringle,* no. 10215 (as *C. occidentalis*) [G, NY, US]; Bagre, Minas de San Rafael, San Luis Potosi, *Purpus,* no. 5187 [Type in US, isotypes in NY, G]; El Barrendo near Muzquiz, Coahuila, *S. S. White,* no. 1853 [G]; mountain stream, se. of Saltillo, Coahuila, *O. M. Clark,* no. 6690 [OU]. *Fl.* Mar.–Apr. Map III.

This plant differs from the typical form and from the var. *texensis* only in having the young branches and petioles covered with a brownish, very tomentose pubescence.

The leaves vary considerably. Those of the type and isotypes (*Purpus,* no. 5187) have them distinctly ovate with a cordate base and acute apex and a shallow sinus, but very coriaceous in texture. In this respect they resemble the leaves of the typical form, but because of their texture and sheen they also resemble the var. *texensis.* In many of these specimens the leaves not only have the sheen and the texture of the var. *texensis* but also have the general reniform shape. The very great difference in leaf-shape of this variety makes evident once again the fact that this character is most unstable. It appears that the more common leaf-shape of the var. *mexicana* is the reniform one and because of this, one regrets that Rose did not assign a specimen illus-

trating this shape as his type, instead of a plant having rather cordate leaves, as the *Purpus* one. In fact, when I laid out on a table all the herbarium sheets of this variety (*mexicana*) one of my students came along accidentally and was so impressed by the difference in leaf shapes that when I asked him whether he thought all the plants belonged to the same species he could not help from exclaiming: "Why, man, even a blind man could see that you've got several species there!" In vain did both of us endeavor to seek differences other than mere leaf-shape, but to no avail. His final conclusions, after working with me for a couple of days, substantiate mine, that the plant differs from the others only by the presence of the very characteristic pubescence.

Nor do the flowers, fruits, or seeds of var. *mexicana* differ either from the typical form of this species or from the var. *texensis*. This same student even suggested that the palmate veins at the base of the leaves be counted. Being grateful for any suggestions which might help me to differentiate these three entities on some basis other than those already described, this was done. There appears to be no constancy in this feature, the veins varying from 7 to 9 in the typical form and in each of the different varieties. Therefore, the conclusion that the var. *mexicana* represents merely another variety of the typical form was further substantiated.

The plant is quite common on the limestone hills and bluffs of the Edwards Plateau area of Texas where it appears almost dominant (with *C. canadensis* var. *texensis* often becoming a co-dominant with it). It also is frequent in the Trans-Pecos area of that state. From New Mexico there is available only one specimen, without definite locality and with a label which bears the annotation: "Plants of Texas and New Mexico." This label has the words "Texas and" scratched out, which obviously places the plant in the latter state. But the only comment on the label appears the cryptic one: "Camels eat this." Dr. W. H. Camp of the New York Botanical Garden has written to Mr. W. A. Dayton (see comments above regarding *C. arizonica*) concerning this specimen in his usual humorous vein, as follows: "I don't suppose that overgrazing by this animal is a serious problem, at least not in New Mexico." Further collections from that state should be obtained before it would be safe to list it definitely

from that region. Its occurrence is not listed in Wooton & Standley's *Flora of New Mexico*, which volume carries no mention of the genus *Cercis* whatsoever.

From old Mexico I have seen specimens, also growing in calcareous habitats, in the northern and central regions.

One station near West Dallas, Texas, is represented by several specimens from the Reverchon Herbarium which is now incorporated in the Herbarium of the Missouri Botanical Garden. Because the plant is found in Dallas, which is only about one hundred miles south of the Oklahoma line, we have been hoping to be able to include it in the flora of the Arbuckle Mountains. Diligent field work in that area has not, at the present writing, revealed its occurrence there.

Phylogenetic Relationships. My postulation regarding the phylogeny of *Cercis* may be summed up briefly. It appears to me as though *C. canadensis*, the Appalachian plant which now covers so much of eastern North America, must be regarded as the oldest entity on this continent.

C. occidentalis probably evolved originally as a variety of *C. canadensis* with its range extending westward. Then, being cut off from its relatives by climatic and physiographic factors, it was unable to back-cross with its parent and hence developed as a separate entity. That geographic isolation is a cogent force in the development of new species is well known, and, in my concept, *C. occidentalis* beautifully illustrates this fact.

Var. *texensis* also evolved from *C. canadensis*, probably on the old limestones of the Comanchian seabed in central North America,[1] and its coriaceous leaf might have had a positive survival value in the very calcareous soil. But it was never entirely remote from, nor cut off from, the typical form and hence its present distribution somewhat overlaps that of *C. canadensis* although it has migrated considerably southwestward on the limestone soils. Geographically, it illustrates our current interpretation of a taxonomic variety and morphologically it further substantiates this concept.

Later, and possibly due to climatic conditions which may have brought about a mutation or a chromosomal aberration, a third entity arose. This grew on the old limestones also but in a more

[1] For extent of this seabed see Hopkins, in Rhodora. **40**. 428 (1938).

xeric environment. In this case the adaptive response for this extreme might be observed in the tomentose pubescence of twigs and petioles, but otherwise there were no obvious differences.

These two varieties then increased the geographic distribution of the genus as a whole so that its present range includes most of central, east central, and south central North America. *C. canadensis* var. *typica* and the varieties *texensis* and *mexicana* are not too unlike to make such an explanation for their ranges plausible. And *C. occidentalis,* because of its isolation, would of course have been expected to evolve into a separate species morphologically unlike its relatives.

Regarding the glabrous form of *C. canadensis* it appears to be merely an ecological response and occurring as it does throughout the range of the typical form is worthy only of recognition as a form rather than as a variety.

The geographic distribution of the genus in America is illustrated by the accompanying maps.

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A NOTE ON SAGITTARIA KURZIANA

Walter V. Brown

When Glück[1] described his *Sagittaria Kurziana* he found no mature achenes on the plants collected. As a result his description lacks data concerning this fundamental structure. Small[2] also had no achenes of this species for study when he reduced it to synonomy. As a result the status of this form has been uncertain.

A number of plants of *S. Kurziana* were collected from the St. Marks river at Newport, west Florida, one of the stations where Glück collected type material. Achenes were obtained from one of the plants growing in a green-house pool as the result of crossing one of its pistillate flowers with pollen from a plant of *S. stagnorum* Small. As there were no staminate flowers of *S. Kurziana* in bloom at the time this was the only source of likely pollen and so was used. The resulting mature achenes contained

[1] Glück, Hugo. 1927. Bull. Torr. Bot. Club 54: 257–261.
[2] Small, J. K. 1933. Manual of the Southeastern Flora, p. 24.

viable seeds and a number of healthy hybrid plants were obtained. Some achenes were dried and added to herbarium specimens of the pistillate plant. There may be some question as to whether the form and shape of the achenes produced by the above cross are affected by the pollen. In cases where the shape of the fruit is affected by the pollen the effect is indirect. Pollen does affect the endosperm and embryo so that changes in these structures may modify the form of the fruit, as in corn. In *Sagittaria*, however, there is no endosperm and the embryos of all species are of about the same shape. The characteristic form of these achenes is due to outgrowths of the fruit, crests and beak. There is little probability that these are modified by the

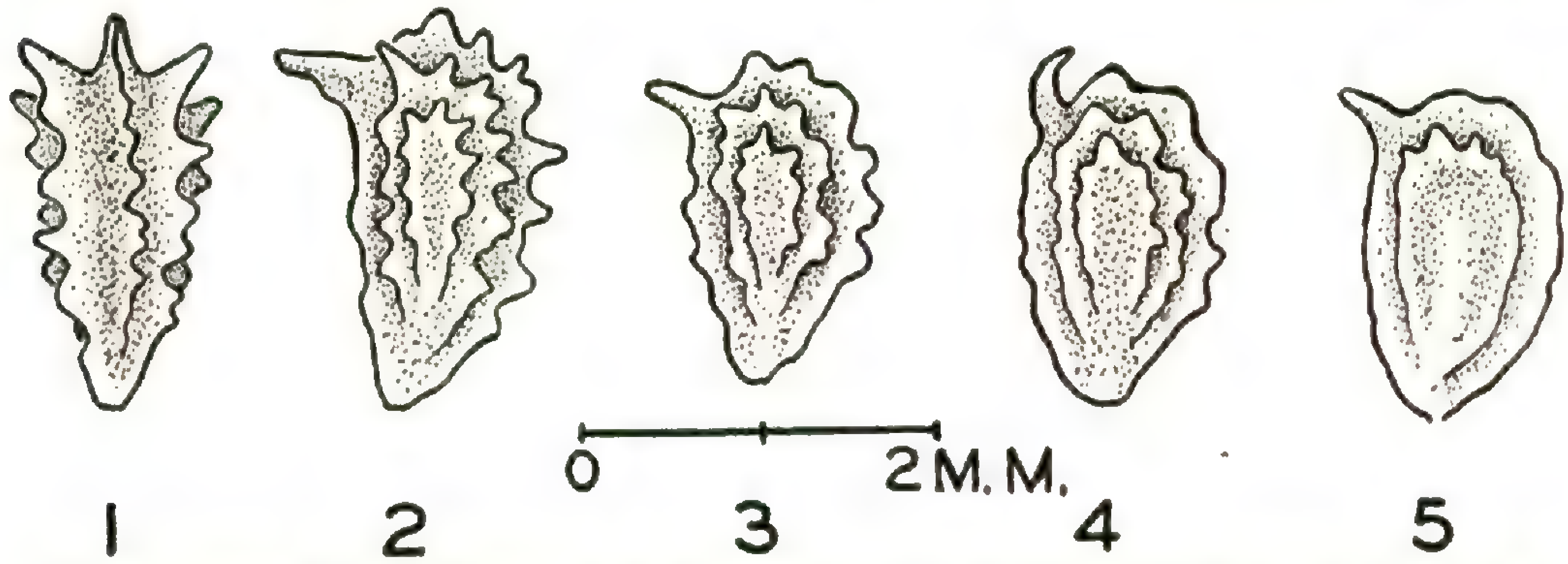

Fig. 1, Back view of achene of S. Kurziana; fig. 2, side view of same; fig. 3, side view of achene of S. lorata; fig. 4, side view of achene of S. stagnorum; fig. 5, side view of achene of S. subulata.

pollen of a different species if mature embryos are formed as was true in this case. A description of these achenes follows.

Pistillate flowers recurving soon after pollination; fruit developing, maturing, and separating from the receptacle under water; fruiting heads 10–12 mm. in diameter, nearly spherical; receptacle obovoid, 6–7 mm. long, 3–4 mm. in diameter; *achene 2.5–3.0 mm. long, crests 5, deeply indented, appearing spiny, beak about 0.4 mm. long, straight, horizontal to slightly inclined.*

This species is closely related to *S. stagnorum* Small, *S. lorata* (Chapm.) Small, and *S. subulata* (L.) Buch. Fernald[1] has recently revised part of this group, considering *S. lorata* and *S. stagnorum* (*S. natans* Michx. not Pall.) as varieties of *S. subulata*. *S. Kurziana* differs from these other three species both vegetatively as Glück has shown and as to achene characters. Differ-

[1] Fernald, M. L. 1940. Rhodora 42: 408–409.

ences in the achenes of these forms are shown in Figs. 1 to 5. The status of *S. Kurziana* should be equal to any of these other three forms, whether of specific or varietal rank.

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REPORTS ON THE FLORA OF MASSACHUSETTS—III.

Owing to the extremely technical character of most of the species included in the present report, it has been necessary to disregard many records in local floras and rely for the most part on actual specimens or on recent monographic works, notably Prof. Fernald's "The Linear-leaved North American species of Potamogeton, Section Axillares." Incidentally the sequence of species in *Potamogeton* used here follows that given on page 29 of his monograph.

In cases where the persistence of a species in a given locality is open to doubt, the latest date of collection is noted. There are quite a number of these "fossil" records, particularly in the vicinity of Boston, and it will be interesting to see if any of them can be rediscovered after sixty or seventy years of oblivion.

One very complete massacre of the flora should be noted in the construction of the Quabbin Reservoir for the Metropolitan Water Supply. Because of its inundation of the Swift River Valley near the junction of Franklin, Hampshire and Worcester Counties, stations for all but complete aquatics must be considered obliterated in practically all of Enfield and Greenwich and large parts of Prescott, New Salem, Dana, Pelham and Belchertown.

TYPHACEAE (Cat-tail Family)

TYPHA L. Cat-tail, Flag.

T. latifolia L. Common Cat-tail. Marshes; common throughout.

Forma **ambigua** (Sonder) Holmb. in Hartmans Handb. Scand. Fl. ed. 12, i. 70 (1922); cf. also Rhodora, xxix. 249, 251 (1927). Rare over the same range as the species.

T. angustifolia L. Marshes; frequent along the coast, rare inland.

SPARGANIACEAE (Bur-reed Family)

SPARGANIUM L. Bur-reed.

S. eurycarpum Engelm. Shallow water; frequent in the East, Brookfield in Worcester County and Sheffield and Stockbridge in Berkshire.

S. androcladum (Engelm.) Morong. (*S. lucidum* of Manual; cf. Rhodora, xxiv. 32 (1922)). Muddy shores; occasional in Essex, Middlesex, Barnstable, Dukes (but only Gosnold), Nantucket and Worcester Counties and the Connecticut Valley.

S. americanum Nutt. (Including var. *androcladum* of Manual; cf. Rhodora, xxiv. 33 (1922)). Bogs and muddy shores; common.

Var. **rigidum** Clausen in Rhodora, xxxix. 189 (1937). Framingham, Middlesex County, *A. J. Eames.*

S. chlorocarpum Rydb. (*S. diversifolium* of Manual; cf. Rhodora, xxiv. 33 (1922)). Muddy and peaty shores or swamps; occasional in the Boston District and westward but known only from Dighton and Somerset in the Southeast.

Var. **acaule** (Beeby) Fernald in Rhodora, xxiv. 33 (1922). Same range as the species but known only from Norton in the Southeast.

S. angustifolium Michx. (Including *S. simplex* of Manual; cf. Rhodora, xxiv. 33 (1922)). Deep or shallow water; old records from West Newbury, Stoneham and Canton in the Boston District, frequent in Berkshire County and not reliably reported elsewhere.

S. fluctuans (Morong) Robinson. Cold waters of lakes and ponds; Hopkinton and Canton in the southern Boston District, formerly occasional in the Swift River Valley in Worcester and Franklin Counties, and occasional in Berkshire.

S. minimum Fries. Cold shallow water; rare in southern Middlesex and in Berkshire County.

POTAMOGETONACEAE (Pondweed Family)

POTAMOGETON L. Pondweed.

P. pectinatus L. Brackish or muddy shallow ponds; North Scituate in Plymouth County, occasional in western Barnstable, Dukes, Nantucket and southern Berkshire Counties.

P. Robbinsii Oakes. In quiet water; occasional in Essex, Middlesex, Suffolk, Plymouth, Bristol, western Barnstable, Worcester and southern Berkshire Counties and the Connecticut Valley.

P. crispus L. Fresh or brackish waters; Cambridge and Arlington in Middlesex County.

P. confervoides Reichenb. Ponds and lakes in siliceous regions; rare stations in Middlesex, Bristol, Worcester and Berkshire Counties.

P. zosteriformis Fernald in Mem. Gray Herb. iii. 36 (1932). (*P. zosterifolius* of Manual). Ponds and quiet streams; rare stations in Essex, Middlesex and Berkshire Counties and in the Connecticut Valley.

P. foliosus Raf. var. **macellus** Fernald in Mem. Gray Herb. iii. 46 (1932). (*P. foliosus* of Manual). Quiet waters, either fresh or brackish; occasional near Boston, rare in Hampshire County and frequent in Berkshire.

P. Friesii Rupr. Fresh Pond, Cambridge, *C. E. Faxon,* July 22, 1880.

P. strictifolius Benn. Calcareous waters; Stockbridge and New Marlboro in Berkshire County. The record in the Flora of the Boston District (Rhodora, xi. 208 (1909)) not traced to any specimen so annotated but sheet of *P. Berchtoldi* var. *tenuissimus* in Gray Herbarium bears identical data.

P. pusillus L. (*P. pusillus* of Manual in part; *P. panormitanus* Biv. var. *major* and *minor,* cf. Fernald in Mem. Gray Herb. iii. 60 (1932) and in Rhodora, xlii. 246 (1940)). Basic or alkaline waters; rare stations in Middlesex, Dukes, Nantucket and Berkshire Counties.

P. gemmiparus Robbins. Slow streams and quiet water; occasional in Middlesex, Norfolk and Worcester Counties and rare in Hampshire and Hampden.

P. Hillii Morong. Slow streams; South Egremont, Berkshire County, *W. A. Archer,* no. 1626, on July 30, 1939.

P. obtusifolius Mert. & Koch. Cold waters, either quiet or moving; occasional in the Boston District and westward, unknown in the Southeast.

P. Berchtoldi Fieber. (*P. Sturrockii* of Manual, not Benn.; *P. pusillus* var. *mucronatus* (Fieber) Graebner; cf. Fernald in Mem. Gray Herb. iii. 80 (1932) for key to varieties and in Rhodora, xlii. 246 (1940) for their transfer). Fresh or brackish waters; occasional in Essex, Middlesex, Plymouth, Barnstable, Dukes, Worcester and Hampden Counties.

Var. **polyphyllus** (Morong) Fernald. Occasional in Middlesex, Dukes, Hampden and Berkshire Counties.

Var. **acuminatus** Fieber. (*P. pusillus* auctt., non L.). Occasional in the Boston District, rare in Barnstable, Nantucket, Worcester and Berkshire Counties.

Var. **tenuissimus** (Mert. & Koch) Fernald. (Including *P. pusillus* var. *capitatus* Benn.). Occasional in the eastern half of the state, Greenfield in Franklin County and Ware in Hampshire.

Var. **lacunatus** (Hagström) Fernald. Occasional in Middlesex, Suffolk, Norfolk, Plymouth and Hampden Counties.

P. Vaseyi Robbins. Quiet waters; occasional in Essex, Middlesex, Worcester, Franklin and Berkshire Counties.

P. lateralis Morong. Charles River, Needham and Dedham in Norfolk County, *C. E. Faxon*, in 1879 and 1880.

P. Spirillus Tuckerm. (*P. dimorphus* of Manual in part, not Raf.; cf. Fernald in Mem. Gray Herb. iii. 100 (1932)). Shallow quiet water, usually on clay bottom; frequent in the Boston District, occasional elsewhere on the mainland.

P. capillaceus Poir. (*P. hybridus* of Manual, including var. *multi-denticulatus* (Morong) Asch. & Graebn.; cf. Fernald in Mem. Gray Herb. iii. 109, 110 (1932)). Quiet shallow water; common in the eastern half of the State, occasional in Hampden County, rare elsewhere in the western half.

P. epihydrus Raf. (*P. epihydrus* var. *cayugensis* of Manual; cf. Fernald in Mem. Gray Herb. iii. 114 (1932)). Still or flowing water; Sheffield in Berkshire County, *C. H. Knowlton*, Sept. 5, 1915.

Var. **Nuttallii** (Cham. & Schdl.) Fernald in Mem. Gray Herb. iii. 115 (1932). (*P. epihydrus* of Manual). Common in the eastern part of the state and in Hampshire county, frequent in Hampden and rare in Worcester, Franklin, and Berkshire Counties.

P. tenuifolius Raf. (*P. alpinus* of Manual in part; cf. Fernald in Rhodora, xxxiii. 209 (1931)). Streams; Richmond in Berkshire County, *J. W. Robbins*, in 1864.

P. pulcher Tuckerm. Ponds and slow streams; occasional in the Boston District, rare in Plymouth, Bristol, Nantucket, Worcester, Hampshire and Hampden Counties, frequent in Gosnold in Dukes County.

P. amplifolius Tuckerm. Ponds and rivers; occasional in Essex, Middlesex, Norfolk, Plymouth, Worcester, Hampshire, Hampden and Berkshire Counties.

P. americanus Cham. & Schdl. Streams; occasional in the Boston District and in Berkshire County, rare in Franklin and Hampden.

P. natans L. Ponds and quiet streams; common in the Boston District and westward, rare in Plymouth and Bristol Counties, Eastham in Barnstable.

P. Oakesianus Robbins. Ponds and quiet streams; common in the Southeast, occasional in the Boston District and in southern Worcester and Berkshire County, rather frequent in the Connecticut Valley.

P. illinoensis Morong. (*P. lucens* of Manual, *P. angustifolius* auctt.; cf. Fernald in Mem. Gray Herb. iii. 29 (1932)). Ponds; rare records in the Boston District and probably persistent only

in Wenham in Essex County, Leverett in Franklin County, frequent in southern Berkshire County.

P. gramineus L. var. **graminifolius** Fries. (*P. heterophyllus* of Manual including forms, non Schreb.; cf. Fernald in Rhodora, xxiii. 189 (1921)). Ponds and streams; frequent in the Boston District and westward, but not known in the Southeast.

Var. **spathulaeformis** Robbins. (Cf. Rhodora, xxiii. 190 (1921)). Mystic Pond, Medford, Middlesex County, until 1881.

P. praelongus Wulf. Ponds and lakes in deep water; Haverhill, Hamilton and Wenham in Essex County, Cambridge in Middlesex, and rare in Franklin, Hampden and Berkshire Counties.

P. Richardsonii (Benn.) Rydb. Mill River, New Marlboro, Berkshire County, R. Hoffmann, July 24, 1912.

P. bupleuroides Fernald. Fresh to brackish shallow water; occasional throughout.

× **P. mysticus** Morong. Mystic Pond, Medford, Middlesex County, until 1881.

× **P. subnitens** Hagström in Kgl. Sv. Vet. Akad. Handl. lv. no. 5, 259 (1916). (*P. bupleuroides* × *gramineus*, *P. nitens* Am. auctt.). Wenham Pond, North Beverly, Essex County, until 1886.

RUPPIA L. Ditch Grass.

(Cf. Rhodora, xvi. 119 (1914) for varieties).

R. maritima L. var. **longipes** Hagström. Brackish water; frequent all along the coast.

Var. **rostrata** Agardh. Frequent along the coast.

Var. **subcapitata** Fernald & Wiegand. Along the coast. Apparently less common than the two preceding varieties.

ZANNICHELLIA L. Horned Pondweed.

Z. palustris L. var. **major** (Boenningh.) Koch. (Cf. Rhodora, xxiii. 110 (1921)). Brackish water; rare along the coast.

ZOSTERA L. Grass Wrack, Eel Grass.

Z. marina L. var. **stenophylla** Aschers. & Graebn. (Cf. Rhodora, xxxv. 92 (1933)). Shallow seawater on muddy or sandy bottom; common all along the coast.

NAJADACEAE (Naiad Family)

NAJAS L. Naiad.

(Cf. Rhodora, xxv. 105 (1923)).

N. flexilis (Willd.) Rostk. & Schmidt. (Including var. *robusta* Morong). Fresh or brackish water; common in the Boston District, occasional elsewhere.

N. guadalupensis (Spreng.) Morong. In barrier beach ponds; occasional in Dukes and Nantucket Counties, Falmouth in Barnstable County (cf. Rhodora, xxx. 136 (1928)).

N. gracillima (A. Br.) Magnus. Muddy, peaty or sandy ponds or pools; occasional in the Boston District, rare in Plymouth, Barnstable, Dukes, Worcester and Hampshire Counties, common in Franklin and Hampden Counties.

JUNCAGINACEAE (Arrow Grass Family)

SCHEUCHZERIA L.

S. palustris L. var. **americana** Fernald in Rhodora, xxv. 178 (1923). Bogs; rare in the Boston District and westward, not known in the Southeast.

TRIGLOCHIN L. Arrow Grass.

T. maritima L. Saltmarshes; common along the coast.

ALISMACEAE (Water-Plantain Family)

SAGITTARIA L. Arrow-head.

S. latifolia Willd. Shallow water or wet places; common throughout. The following forms with the same habitat and range as the species proper:

Forma **obtusa** (Muhl.) Robinson.
Forma **hastata** (Pursh) Robinson.
Forma **gracilis** (Pursh) Robinson.
Forma **diversifolia** (Engelm.) Robinson.

S. Engelmanniana J. G. Sm. Muddy or sandy pond margins; rare in the Boston District, frequent in the Southeast, rare in southern and western Worcester County and central Hampden County, New Salem in Franklin County.

Forma **dilatata** Fernald in Rhodora, xxxviii. 74 (1936). Yarmouth in Barnstable County, *Fernald & Long*, no. 8466 (type).

S. cuneata Sheldon. (*S. arifolia* Nutt.; cf. Fernald in Rhodora, xxiii. 192 (1921)). Shallow water; Holyoke in Hampden County, occasional in the Housatonic Valley in Berkshire County.

S. rigida Pursh. (*S. heterophylla* Pursh var. *rigida* Engelm.). Nantucket, *Nellie F. Flynn*, Aug. 20, 1899.

Forma **fluitans** (Engelm.) Fernald in Rhodora, xxxviii. 73 (1936). (*S. heterophylla* var. *angustifolia* Engelm., *S. heterophylla* forma *fluitans* (Engelm.) Blake). Shallow pond margins; occasional in southern Berkshire County.

Forma **elliptica** (Engelm.) Fernald in RHODORA, xxxviii. 74 (1936). (*S. heterophylla* var. *elliptica* Engelm.). Muddy banks of the Merrimac River, Lowell in Middlesex County and Lawrence and West Newbury in Essex, also very rare in Amherst in Hampshire County.

S. graminea Michx. Muddy shores; occasional in the Boston District and in Plymouth and Bristol Counties, Sandwich in Barnstable, occasional in Worcester County, Leverett and New Salem in Franklin, frequent in Hampshire, Ludlow and Holland in Hampden and occasional in Berkshire County.

S. teres Wats. In shallow water; Lincoln in Middlesex County, Plymouth and Lakeville in Plymouth, western Barnstable County, Warwick in Franklin and Springfield in Hampden.

S. subulata (L.) Buchenau. Muddy tidal riverbanks; Hanover and Wareham in Plymouth County.

Var. **gracillima** (Wats.) J. G. Sm. Wholly submerged in rivers; occasional in the Boston District, Pembroke in Plymouth County and Norton in Bristol.

LOPHOTOCARPUS Th. Durand

L. spongiosus (Engelm.) J. G. Sm. Tidal mud of estuaries; occasional in Essex and Middlesex Counties.

Forma **laminatus** Fernald in RHODORA, xxxviii. 73 (1936). Same range as the species.

ECHINODORUS Richard

E. tenellus (Martius) Buchenau. Muddy pond shores; Winchester, Cambridge and Watertown in Middlesex County. No collections later than 1903.

ALISMA L. WATER-PLANTAIN.

A. Plantago-aquatica L. (*A. brevipes* Greene). The large-flowered form with corolla 7–13 mm. wide and achenes 2.2–3 mm. long; cf. Wiegand and Eames, Fl. Cayuga Lake Basin, 53 (1926). Muddy shores; occasional in the Boston District.

Var. **parviflorum** (Pursh) Farwell in Rept. Comm. Parks and Boulev. Detroit, xi. 44 (1900). (*A. subcaudatum* Raf.). The small-flowered form with corolla 3–5.5 mm. wide and achenes 1.5–2 mm. long. Muddy shores; frequent in the Boston District and westward, occasional in Bristol and Nantucket Counties and western Barnstable County.

HYDROCHARITACEAE (FROG'S BIT FAMILY)

ANACHARIS Rich. WATER-WEED.

A. canadensis (Michx.) Planch. (*Elodea canadensis* of Manual in part; cf. Victorin in Contrib. Lab. Bot. Univ. Mon-

tréal, xviii. 40 (1931)). Calcicolous waters; rare stations in Essex, Middlesex and Berkshire Counties and in the Connecticut Valley.

Var. **Planchonii** (Casp.) Victorin in Contrib. Lab. Bot. Univ. Montréal, xviii. 40 (1931). East Andover in Essex County and Wakefield in Middlesex.

A. occidentalis (Pursh) Victorin in Contrib. Lab. Bot. Univ. Montréal, xviii. 40 (1931). (*Elodea canadensis* of Manual in part). Pond and river margins; occasional in the East on the mainland (except eastern Barnstable County) and sometimes becoming a nuisance, also Brookfield in Worcester County and occasional in Hampshire and Hampden Counties.

A. densa (Planch.) Victorin in Contrib. Lab. Bot. Univ. Montréal, xviii. 41 (1931). Established in Abington, Plymouth County (Knowlton in Rhodora, xlii. 524 (1940)).

VALLISNERIA L. Tape Grass. Eel Grass.

V. americana Michx. (*V. spiralis* of Manual, not L.; cf. Rhodora, xx. 108 (1918)). Shallow fresh water; frequent.

A. S. Goodale
F. W. Grigg
A. H. Gustafson
S. K. Harris
C. H. Knowlton
David Potter
S. N. F. Sanford
F. C. Seymour
L. B. Smith, *Chairman*

Committee on the Flora of Massachusetts.

LILIUM SUPERBUM AND L. MICHIGANENSE

Edwin D. Hull

In 1915 Farwell[1] described a new species of *Lilium*, which he called *L. michiganense*, including a typical form and two varieties, *L. m. umbelliferum* and *L. m. uniflorum*. Heretofore these plants had been considered as *L. superbum* L. Farwell's species appears to have been accepted by many botanists. Deam[2] considers it to be the usual form in Indiana, *L. superbum* being very rare in

[1] Notes on Michigan Liliaceae. Bull. Torr. Bot. Club 42: 351–358.
[2] Flora of Indiana: 313, 314. 1940.

that state. L. H. Bailey, accepting it as valid, includes it in his Hortus Second, and gives its distribution as from Michigan to Minnesota and Missouri. However, the plants are still *L. superbum* to conservative botanists, and, after a study of them as they occur in the dune country of northern Indiana, where they are fairly common, and after comparing these specimens with typical *L. superbum* from the Atlantic Coastal Plain, I am convinced that the conservative viewpoint is the correct one. They should not be separated from *L. superbum*, which, like many others, seems to be a variable species, the variations depending partly on known causes, especially those of environment, and partly on causes that are obscure.

The habitats in which the Indiana plants were studied are three. In the northern portion of East Gary, Lake Co., there is a large wet prairie traversed by the Little Calumet River. This stream has been straightened, and the land made drier, by digging of the Burns Ditch. This area is practically treeless, and the lilies are exposed to full sun throughout the day, except for whatever shade is afforded by neighboring plants, for the most part coarse grasses, with a sprinkling of phlox and other prairie forms. A second habitat is on the eastern edge of this area, an oak woods with an undergrowth of crabapple and hazel. Through this woods a small swift stream, Willow Creek, has cut a rather deep canyon, and the area has become as dry as if a ditch had been dug. *Lilium* occurs here to some extent, but the plants are small, and, though I have observed them for many years, they have never flowered, although vegetative reproduction takes place. The third habitat is a piece of low, wet woods adjacent to a large swamp in the eastern part of the Indiana Dunes State Park at Tremont, Porter Co. Here, although heavily shaded, *Lilium* flowers as well as it does in the open prairie. In this park the plants were studied as well as could be without injury to them.

Bulbs. Indiana Dunes specimens are somewhat variable, in general globose, in one specimen distinctly subglobose. Coastal Plain specimens did not differ materially.

Height. Eleven specimens from Indiana Dunes showed a range from 6.7–12.6 dm., average 9.7 dm. The drying out of the swamp referred to has undoubtedly been a factor in the short

height. Years ago the tallest plants were much higher. The number of flowers may have nothing to do with height. A 1-flowered specimen may be taller than a 2-flowered plant; on the other hand the plants with the largest number of flowers were the tallest. Height of 15 Coastal Plain specimens 4.9–15.8 dm., average 9.7 dm., the average being the same in plants from both areas. The shortest plant, along with others, occurred at the "edge of tidal meadows, where nearly fresh except at very high tide" (Connecticut, Greenwich, Sept. 7, 1927, *E. H. Eames, 10409*). In spite of its brief stature this plant bore five flowers. Height in *L. michiganense* 1–2 m. according to Farwell.

Leaf-Arrangement. Indiana plants have in general the first leaves put out solitary, then arranged in whorls until the inflorescence is approached, where solitary leaves are almost certain to occur in flowering specimens, either all leaves solitary, or mingled with perfect whorls. Or the leaves may occur in imperfect whorls, that is, 2–3 leaves arranged at one side of the stem, not entirely surrounding it. A single specimen at Tremont had all the leaves solitary except two at one side at the very top, a situation about like that in two Coastal Plain plants (Connecticut, Voluntown, Aug. 6, 1920, *C. B. Graves & R. W. Woodward;* New Jersey, Hoboken, July 27, 1854, *A. C. Hexamer & F. W. Maier*). Non-flowering plants usually have the uppermost leaves in perfect whorls. Very rarely a solitary leaf may occur among the whorls in the middle portion of the stem. There is not the slightest difference in leaf-arrangement between Indiana Dunes and Coastal Plain specimens.

Number of Leaves to a Whorl. In Indiana Dunes plants 10 specimens of perfect whorls varied from 3–13, average about 8. Forty specimens from the Coastal Plain varied from 4–18, average about 7.

Leaf-Form. Indiana Dunes specimens varied from linear-lanceolate to oblong-lanceolate, with the linear type the more common. Environment has much to do with leaf-form, as leaves are widest in wooded areas, a typical leaf from the dry woods referred to in the notes on habitats being 8 cm. long by 2 cm. wide. Coastal Plain specimens showed the same variations, with, however, the oblong type being somewhat more frequent. Two of the eastern specimens had very broad leaves (West

Virginia, Blue Ridge, Rockbridge Co., Aug., 1880, *W. H. Seaman;* North Carolina, Blowing Rock, North Carolina Mts., Aug. 8, 1893, *B. L. Robinson, 124*). While the labels did not state, both of these plants were probably from wooded areas. All leaves, whether from east or west, are long-attenuate at both ends, except the basal portion of the leaves subtending the inflorescence, where they are short-attenuate, a character which seems unimportant, since it is common to many species to have the leaves immediately below the inflorescence modified. Long-attenuate leaves constitute one of the few characters which do not vary.

Surfaces of Leaves. All leaves, whether from eastern or western forms, were smooth above. Indiana Dunes specimens had the lower surface of all leaves roughened with scale-like hairs, except that leaves from woods were rough on margin only. Of 47 Coastal Plain leaves 19 were entirely smooth, 10 were roughened on margins only, while 18 were roughened on the principal veins also. A few had some of the leaves roughened while the others were smooth in the same plant. (Illustration: Virginia, James City Co., July 23, 1939, *R. W. Menzel, 183*). Deam found "*Lilium superbum*" with smooth leaves "always on wooded slopes". A Coastal Plain specimen from "dry, sandy soil" had the lower surface roughened (New Jersey, New Lisbon, Burlington Co., Oct. 13, 1899, *Alexander MacElwee,* 1570). In Ohio, between Indiana Dunes and the Coastal Plain, of two specimens one was smooth throughout (Nelson Twp., Portage Co., July 23, 1922, *Roscoe J. Webb*, bank of stream), while the other was roughened on the margins (Braceville, Trumbull Co., July 24, 1904, *A. N. Rood, 768*). Farwell states that some of the leaves of *L. michiganense* are smooth, which he calls a transition to *L. superbum.* Pubescence seems to be largely a matter of habitat.

Nervation. In Indiana Dunes plants the number of conspicuous nerves varies from 3–6, with 3 much the most common. In Coastal Plain plants conspicuous nerves varied from 3–7, with 3 much the most common. Farwell says of *L. michiganense* 3–7-nerved. The width of the leaf has something to do with the number of nerves.

Flower-numbers. From the Indiana Dunes 11 plants varied

from 1–10 in number of flowers, average about 5. From the Coastal Plain 43 plants varied from 1–12, average about 4. The amount of available water in the soil is undoubtedly a factor in flower production, according to Deam and my own observations. Deam says that *L. michiganense* in the driest soil produces but one flower. I have before noted in this paper that the plants never flower in the dry oak woods, the dry character of which is indicated by the undergrowth of crabapple and hazel. Specimens planted in my garden had in 1938 4 flowers, then became depauperate because grape vines took too much water from the soil, and in 1939 had but one flower, these plants then corresponding exactly to the description of *L. m. uniflorum* in Farwell's article. Planted in a better environment they were still 1-flowered in 1940, but in 1941 produced 4 flowers again. *L. m. uniflorum* does not seem to be a good variety, as flower-production depends largely on environment, also, of course, on the age of the plant. *L. m. uniflorum* is either a juvenile or depauperate form. What is true of this variety may also be true of *L. m. umbelliferum;* it may not have attained its full maturity, or it may be a once robust plant become somewhat depauperate.

Flower-Arrangement. The flowers of typical *L. michiganense* are arranged in a pyramidal cluster according to Farwell, but strictly in umbels according to Deam. Deam's description corresponds with that of *L. m. umbelliferum* of Farwell. *L. m. uniflorum,* of course, bears but a single flower. In *L. superbum* the flowers are produced in umbels or pyramidal racemes according to Deam, and in a pyramidal raceme according to Gray.[1] My own observations, on both Indiana Dunes and Coastal Plain specimens, show that, just as the leaves tend to occur in whorls but may be solitary, so the flowers tend to be in umbels, but racemose flowers may occur in a cluster whose general nature is umbelliferous. Often, however, whether east or west, the flowers are strictly in umbels. In a few inflorescences all the flowers are racemose, or all the lower flowers may be racemose with the upper two paired. The peduncles, of Indiana specimens at least, are sometimes more or less united (fasciation), making what is in reality an umbel appear somewhat like a pyramidal raceme.

[1] New Manual of Botany, 7th Edition, 1908.

Flower-Size. Considerable variation occurs, depending largely on environmental conditions, or on the number of flowers. Solitary flowers tend to be larger than those which are in clusters. There is no difference in this regard between eastern and western forms.

Peduncles. Ten specimens from Indiana Dunes showed a variation in length from 10–22.5 cm., average 17 cm., longest on 1-flowered plants. Of Coastal Plain specimens, 49 showed a variation from 6–22 cm., average about 13 cm. Farwell gives the length of the peduncles of *L. michiganense* as 10–12 cm.

Curvature of Perianth-Segments. Strongly revolute segments are characteristic of *L. superbum*, and, according to Farwell, of *L. michiganense* also. Deam says that the segments are recurved from near the middle in *L. michiganense*, and from near the base in *L. superbum*. Farwell says that in *L. michiganense* the segments are recurved to below the middle. In Indiana Dunes specimens a study of fresh material shows that curvature starts from the basal portion at about one-third the length of the perianth-segments. This would be nearer the middle than the base. Of 37 Coastal Plain flowers 19 showed about the same curvature as the Indiana specimens, while 18 showed this feature to start much nearer the base. Always the curvature starts below the middle. Age of the flower certainly has something to do with the curvature of the perianth-segments. Newly opened flowers may show for a considerable time no more curvature than is found in *L. canadense*. Always, however, the segments are eventually strongly revolute. This is one of the few characters which remain constant.

Flower-color. *L. superbum* is described in Gray's Manual as orange with dark-purple spots. *L. michiganense*, according to Deam, is orange to reddish-orange outside, and according to Farwell orange-red externally and on the blade internally, the mid-vein being orange-yellow, and the claw pale yellow or whitish, with the numerous spots crimson. In fresh Indiana Dunes material from open places the sepals were orange-red outside, with narrow yellow margin near the base, mid-vein inconspicuous, lighter. The petals outside were like the sepals, but with a wider margin of yellow near the base, mid-vein conspicuous, lighter. Both sepals and petals inside had a base of

green, then were colored yellow with numerous spots for about one-half the length, while the remainder was orange-red. Spots were purple with crimson margin, the heaviest deposit of pigment being in the center. Flowers from shaded places were lighter in color, more nearly orange than red, and the spots were crimson throughout. Coastal Plain specimens were for the most part orange, though a few showed decidedly red, always, however, with a trace of orange. Of these few one is given as an example (District of Columbia, near Washington, July 21, 1878, *Lester F. Ward*). There is no outstanding difference between Indiana Dunes and Coastal Plain flowers, most of the Coastal Plain specimens being colored exactly as Indiana Dunes plants from shaded habitats. Light apparently has something to do with the color-scheme.

Anthers. Length, according to Deam, 20–25 mm. in *L. superbum*, 8–12 mm. long in *L. michiganense*. Fresh specimens from Indiana Dunes showed a great variation of from 4–26 mm., average about 16 mm., mostly at anthesis, the longest from large opening buds before anthesis. Coastal plain specimens varied from 11–12 mm., average about 16 mm., the same as the average from the Dunes specimens. The size of the flower has much to do with anther-length, the smallest flowers having as a rule the shortest anthers.

Capsules. Indiana Dunes, 25 specimens, showed a variation from oblong (17) to obovate (8). Coastal Plain, 15 specimens, varied from oblong (8) to obovate (7). A single plant may show both forms of capsules, those being the better filled out with seeds having the oblong form.

Seeds. There is no noticeable difference between the seeds of eastern and western forms.

Conclusions. Indiana Dunes specimens are quite variable in every character, with three outstanding exceptions, namely, the leaves long-attenuate at both ends, the strongly revolute perianth segments, and the seeds. Coastal Plain specimens, all belonging to typical *L. superbum*, have the same constant characters, otherwise they vary just as do the plants from the Dunes. There is not a single good character which would justify making a new species, or even a new variety, from the old *L. superbum*. Therefore, it is my opinion that *L. michiganense* is

not a valid species, and that all the plants included therein really belong to *L. superbum*.

Indiana material on which this study was based, where collections were possible, has been deposited in the Gray Herbarium.

I wish to express my appreciation to Professor M. L. Fernald, Director of the Gray Herbarium, for the loan of typical specimens of *L. superbum*, and for invaluable advice and suggestions, and to Director Clifford C. Gregg and Dr. Paul C. Standley of the Field Museum of Natural History for affording me excellent facilities for work.

Gary, Indiana

Panicum recognitum in Rhode Island—While botanizing last summer near Diamond Hill in the town of Cumberland, Providence County, Rhode Island, I came upon a *Panicum* that did not seem to fit the description of any species in the manuals, nor could it be matched in the herbarium of the New England Botanical Club. Professor Fernald has examined the specimen and has identified it as *Panicum recognitum* Fernald (Rhodora xl. 331, plates 497 and 498. 1938), and it seems to agree very closely with the description of that species. As this plant was previously known only from southern New Jersey and southern Pennsylvania, its discovery in northern Rhode Island constitutes quite an extension in range and adds an interesting species to the grass flora of New England.

Panicum recognitum is a conspicuous plant on account of its tall growth, some of the culms exceeding a meter in height. It seems to be well distinguished from similar and related species by several characters pointed out in the description. The plants collected in Rhode Island were found in boggy ground along the margins of a brook, growing among other tall herbs and low shrubs. A specimen will be found in the Gray Herbarium under my number 45594, Aug. 24, 1941.—Ernest J. Palmer, Arnold Arboretum.

Pluchea purpurascens (Sw.) DC., var. **succulenta,** var. nov., foliis sessilibus vel breve petiolatis rhomboideo- vel oblongo-ovatis vel obovatis glabris vel glabratis succulentis; capitulis 5.5–9 mm. altis, phyllaribus exterioribus ellipticis vel oblongo-ovatis, sparse pilosis.—Saline, brackish and, sometimes, fresh

marshes and shores Florida to southern Maine; inland in western New York. Type: ditch in old marsh, Back Bay, Boston, Massachusetts, September 17, 1910, *E. F. Williams* in Herb. Gray.

Pluchea purpurascens, var. *succulenta* is the plant which, in Rhodora, xli. 461 (1939), I called *P. marilandica* (Michx.) Cass. in Dict. Sci. Nat. xlii. 2 (1826), I then (p. 459, 560, pl. 569) showing that the Linnean type of *Erigeron camphoratum*, basis of *Pluchea camphorata* (L.) DC., is *P. petiolata* Cass. Typical *P. purpurascens* is tropical and subtropical, extending north to southeastern Virginia. Its lanceolate to elliptic leaves are firm and canescent-pilose beneath, and its involucres 4–5 mm. high, with outer phyllaries ovate-acuminate. Southward and northward the two extremes seem fairly distinct, but in eastern Virginia and North Carolina it is difficult to find clear differentiation. I am, therefore, treating the usually more northern, more succulent, smoother-leaved and larger-headed plant as a variety. In doing so I have purposely refrained from taking up *Conyza marilandica* Michx. There seems to be some doubt about its identity and I have been unsuccessful in my effort to secure a photograph of it. Otto Kuntze, with the indefiniteness so characteristic of him, published, in his Rev. Gen. Pl. i. 357 (1891), the following paragraph:

> **Pluchea camphorata** DC. (L.) α pubescens O. Ktze. U. St.: Hoboken, Cairo, Miss. Die bis auf Blattnerven fast kahl werdende Forme ist β glabrescens O. Ktz. = *Baccharis foetida* L. p.p.

Dr. Wittrock has kindly sent me the only sheet of this series which he has been able to locate in the Kuntze herbarium at New York. This, a badly crumpled specimen from Hoboken, is marked var. *α pubescens;* but, since Kuntze gave no word of description, the name cannot be taken up. No material of Kuntze's *P. camphorata* var. *glabrescens* could be found. Whether it came from Cairo, Illinois or from Mississippi I can not be certain; and Kuntze's statement that it is "*Baccharis foetida* L. p. p." does not help. The type of the latter species is, as generally understood, a white-flowered perennial, with clasping leaves. It would be quite unsafe to take up Kuntze's names.—M. L. Fernald.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

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TWO WEEKS IN SOUTHWESTERN NOVA SCOTIA

C. A. Weatherby

Stimulated by our chance finding of *Lachnanthes* in 1940, my wife and I returned to Nova Scotia for part of August, 1941. We established ourselves at Mill Village, on the lower Medway River, Queens County, selecting that region because the Medway valley abounds in lakes and had not been visited by the Gray Herbarium expeditions of 1920 and 1921. We chose our headquarters happily; our landlady, Mrs. F. Laurie Mack, not only provided us with comfortable lodgings, well suited for botanical work, and excellent food, but was interested in our activities and most helpful in securing for us needed information.

We attempted no strenuous excursions and made no general collections, taking only plants as to the identity of which we were in doubt or which seemed likely, from Prof. Fernald's reports of 1921 and 1922 (in Rhodora, vols. 23 and 24), to be of some geographic interest. Using the car, we scouted along the coast from Liverpool to Bridgewater, followed the Medway from the sea to Ponhook Lake, and visited the more accessible lakes along route 8 from Liverpool to South Brookfield, plus several of those to the east of the Medway. In this area and on the basis noted above, we secured 68 selected numbers.

The whole area visited is in what Goldthwait (Physiography of Nova Scotia, Can. Geol. Surv. Mem. 140 (1924)) calls the southern upland. It is not high, however—Ponhook Lake is 226 ft. above sea-level—and in the Medway valley has no bold relief, though eastward in Lunenburg County the hills become

higher and more rugged. The underlying rocks are the folded slates and quartzites of the gold-bearing series.

Where not cleared for cultivation, the region is covered with a mixed forest of spruce, fir, hemlock, white pine, beech, birch, red maple and red oak (*Quercus borealis*). There is one barren occupied by a sparse stand of red pine with a dense ground-cover of *Arctostaphylos* and *Corema*. A considerable area on route 8, north of Middlefield, supports a nearly pure stand of red oak with an undergrowth of huckleberry, witch hazel, *Viburnum cassinoides* and the like. The deep hollows are, of course, occupied by lakes; the shallower by black-spruce bogs or sometimes by grassy swales where wild hay is often cut by farmers living nearby. We saw no raised bogs like those of eastern Maine. Rich woods are almost entirely absent; one small bit is to be found near Cameron Lake. In the immediate vicinity of the sea the vegetation becomes more boreal; the proportion of spruce in the forest increases notably and such plants as *Vaccinium Vitis-idaea* var. *minus* and *Empetrum nigrum* appear on exposed banks and ledges. As on Cape Cod, the best botanizing is to be found on lake-margins, which here are gravelly, pebbly, rocky or covered with peat. Our investigation of such habitats was more or less interfered with by heavy rains which raised considerably the water-level of streams and the smaller lakes. Fortunately, the larger lakes were not much affected; their strand-floras remained accessible and in reasonably good condition.

As would be expected, the flora of the Medway valley conforms closely to the botanical picture of the western counties drawn in Fernald's reports; but in some details it seems to differ. We did not see *Schizaea;* that tiny plant, however, we might have overlooked. But we should not have overlooked *Polystichum acrostichoides*, which Fernald states the Gray Herbarium botanists saw wherever they went, but which we did not find at all. Such southern and coastal species as *Woodwardia areolata* and *Sabatia Kennedyana* are apparently absent. *Habenaria blephariglottis*, reported by Fernald as abundant in Yarmouth County, we saw only once and that, appropriately, in the vicinity of our first station for *Lachnanthes*. On the other hand, as the list which follows will show, the Medway valley harbors some species, for the most part also of southern affinity, not yet found to the west or east.

In addition to our own collections, we had the privilege of examining an excellent little herbarium prepared by Mr. P. V. Wessman of Liverpool. His records, so far as they are noteworthy, are included in the appended list. Mr. A. E. Roland, the Provincial Botanist, has very kindly furnished helpful data of distribution, drawn from his own field-work and from specimens in the herbarium of the Nova Scotia Department of Agriculture at Truro and in the Canadian National Herbarium. To both these gentlemen, our thanks are due.

Our list follows the plan of Prof. Fernald's reports, to which it is a modest supplement. Introduced species are in italics. Species new to Nova Scotia are indicated by a single asterisk, those new to Canada by two. Place of publication is given for names not in current manuals. Localities are in Queens County unless otherwise indicated. Local extensions of range and even new stations have been rather freely included in the hope that such records may be useful to Canadian botanists who are studying the distribution of Nova Scotian plants in detail. Numbers, unless otherwise noted, are our collection-numbers.

Scheuchzeria palustris L., var. americana Fernald, in Rhodora xxv. 178 (1923). Wet, sphagnous swale, Moosehorn Lake (7094). Recorded by Fernald from Shelburne Co. only; Roland reports it from Lily Lake, Centreville, Kings Co. Apparently not common in western Nova Scotia.

Distichlis spicata (L.) Greene. Upper border of salt marsh, Indian Cove (7086). Since there seem to be few, if any, collections of this species from the south coast, this station is perhaps worth recording.

Oryzopsis pungens (Torr.) Hitchc. Small clumps among dense carpets of bearberry, dry barren east of Greenfield (7084). Recorded by Fernald as characteristic of barrens in Shelburne and Lunenburg Cos.

** Panicum longifolium Torr. Stony strand of Second Christopher Lake (7095).

This material, with open panicle, spikelets rarely more than 2.6 mm. long, second glume equalling the sterile lemma, and indurated lemma (hardly yet in the caryopsis stage) 0.6 mm. wide, seems clearly referable to typical *P. longifolium* as defined by Fernald (Rhodora xxiii. 193). Specimens from First Christopher Lake (7072), though rather young, seem also to belong here.

Eleocharis obtusa (Willd.) Schult. Submersed by high water, strand of Long Lake, between Buckfield and Waterloo, Lunenburg Co. (7107). Not seen elsewhere and apparently infrequent in this part of Nova Scotia, though common enough in the central and eastern portions of the province.

** Scirpus Longii Fernald in Rhodora xiii. 6 (1911). Peaty marsh, shore of Ponhook Lake (7116). One battered individual, probably of this species, at Moosehorn Lake. Hitherto known only from southern New Jersey, eastern Massachusetts and at a single station in Central Connecticut.

Carex vulpinoidea Michx. A few stools in moist ground in an abandoned sawmill clearing, Lake Rossignol Reservoir (formerly Sixteen-mile Lake) (7099). Reported by Fernald from Annapolis Co.; not otherwise known from Nova Scotia.

Carex lenticularis Michx. var. Blakei Dewey. Stony strand of First Christopher Lake, South Brookfield (7069). Probably also along the Medway River. Recorded by Fernald from Lunenburg Co. only.

Carex crinita Lam. var. minor Boott. On the pebbly and mucky strand of Cameron Lake and on other lake-shores. Spikes ascending or spreading, short-peduncled, more or less aggregated at the summit of the culm and not over 3.5 cm. long; the scales short for the species, not exceeding the upper perigynia and commonly less than twice as long as the lower. From the material at hand, this appears to be the prevailing, if not the only, phase of the species in Nova Scotia. It is apparently not common in the western counties.

Carex arctata Boott. Shaded bank above Beartrap Lake (7058). Apparently frequent in rich woods in eastern Nova Scotia and in the north as far west as Digby Co.; not reported from the southwestern counties.

Smilax rotundifolia L. Thickets at several points along the Medway River (7102) and shores of Ponhook Lake near the outlet. Reported by Mackay (Proc. Trans. Nova Scotia Inst. Sci. xi. pt. 2, 287 (1906)) from Yarmouth Co. and by Fernald from Digby and Shelburne Cos.

Lachnanthes tinctoria (Walt.) Ell. In Rhodora xliii. 36 (Jan., 1941), I reported this species from the shores of Ponhook Lake. From the Highway Department map which I was then using, the body of water in question appeared to be only an arm of that lake. A more detailed map and some enquiries, however, show that, though connected with Ponhook, it is regarded as distinct and goes by the name of Beartrap Lake.

At the original station, there were only about a dozen individuals of *Lachnanthes*. This year a similarly small station was

found on the veritable shore of Ponhook Lake near the mouth of Kedron Brook, and a third, much larger, in a peaty marsh by the lake-shore farther west (7117)—the same in which *Scirpus Longii* was found. Here there were scores of plants, though only a few had flowered.

LOPHIOLA AMERICANA (Pursh) Wood. A third Nova Scotia locality on peaty strands of Ponhook Lake (7110). Not abundant at any one place, but scattered for some miles along the lake-shore. Roland adds an additional station at the end of Brier Island, Digby Co.

HABENARIA FLAVA (L.) Spreng. Pebbly strand of Medway River at Mill Village (7086) and above Charleston (7103).

This, though not extreme, appears to be true *H. flava* as defined by Fernald (RHODORA xxiii. 147), the lowest leaves being lanceolate and acute rather than elliptic and obtuse, and the spike rather slender and loose. Recorded by Fernald from Yarmouth Co. only.

CORALLORRHIZA MACULATA Raf. Dry deciduous woods, above Cameron Lake (7065). Large plants 4.5 dm. tall. "A common species inland and northwards in the province" (Roland); apparently not common in the western counties. Not collected by the Gray Herbarium expeditions south or west of Annapolis Co.

* SALIX PEDICELLARIS Pursh. Sphagnous swale north of Middlefield (7098). Though known from Newfoundland, Quebec, New Brunswick and locally south to Connecticut, this species seems never to have been reported from Nova Scotia. The Middlefield material has the leaves glaucous beneath (var. HYPOGLAUCA Fernald).

** ALNUS SERRULATA Ait. Thickets on the banks of Cameron (7059) and First Christopher lakes.

Not authentically known east of southwestern Maine, though reported as "rather common in moist ravines and hillsides at Old Fort and probably all along the coast" by W. A. Stearns in his "Notes on the Natural History of Labrador" in Proc. U. S. Nat. Mus. vi. 134 (1883). Stearns's specimens are in the United States National Herbarium; but Mr. C. V. Morton, who has very kindly looked up the matter for me, states that no material of either *A. serrulata* or *A. incana* from Labrador is to be found there. That the former occurs in Labrador is unlikely; St. John's opinion that Stearns's plant was some form of *A. incana* is in all probability correct. (Mem. Victoria Mus. cxxvi. 81 (1922)).

Polygonum coccineum Muhl. f. terrestre (Willd.) Stanford in Rhodora xxvii. 162 (1925). Mucky slough at Cameron Lake (7064); Medway River above Charleston. Reported by Fernald (as *P. Muhlenbergii*) from Yarmouth Co. only.

Polygonum robustius (Small) Fernald in Rhodora xxiii. 147 (1921). Shores of Medway River above Charleston; strand of First Christopher Lake, South Brookfield (7073). Recorded by Fernald from Yarmouth, Digby and Annapolis Cos.; Roland reports it as common in parts of Kings Co.

Potentilla palustris (L.) Scop. Fresh-water marsh, Broad Cove, Lunenburg Co. (7092). Roland reports this species as very common in the central and northern counties, but rare in the southwest. He has collected it at Hubbards, near the Lunenburg-Halifax county line (his no. 38,298) and at Butler's Lake near Gavelton, Yarmouth Co.

Amphicarpa bracteata (L.) Fernald in Rhodora xxxv. 276 (1933). Moist roadside thickets, South Brookfield (7068). Recorded by Fernald from Halifax Co. only and, though common in the north-central area (Roland), apparently rare in the southwest. Roland reports a specimen from Bridgewater, Lunenburg Co., in the Canadian National Herbarium.

Helianthemum canadense (L.) Michx. A large colony on the border of dry, mixed woods, Greenfield (7120; associated with *Aster undulatus*). The only previous report from Nova Scotia appears to be that of Macoun from Kingston, Kings Co. (Cat. Canadian Pl. i. 491)

Viola primulifolia L. Shaded strand of the Medway River above Charleston (7104), of Ponhook Lake near outlet, and of the Mersey River near Liverpool (*Wessman*). Reported by Fernald from Yarmouth and Shelburne Cos. and from Halifax Co. by Macoun and Burgess, Bot. Gaz. ix. 6 (1884) and by Lawson, Trans. N. S. Inst. Sci 1890–91: 98.

Proserpinaca pectinata Lam. In the Medway valley much more common than *P. palustris*. The latter we saw only once, on the muddy river-bank below Mill Village; the former was found at the same place (7076), at other places along the Medway, at Second Christopher Lake, Ponhook Lake and in a wet swale in the woods north of Middlefield.

Lysimachia ciliata L. (*Steironema ciliatum* (L.) Raf.). Banks of the Mersey River near Liverpool (*Wessman*). Not seen by us. Rare in the western counties; reported from Annapolis by Lindsay and from Yarmouth by Fernald, and collected by Fernald & Long near Bridgewater, Lunenburg Co. For the name, see Fernald in Rhodora xxxix. 438 (1939).

Samolus parviflorus Raf. Am. Monthly Mag. ii. 176 (1818). To the few stations recorded by Fernald may be added: muddy shores of the Medway estuary (7075). For the name, see House in Bull. New York State Mus. ccliv. 558 (1924).

APOCYNUM SIBIRICUM Jacq. f. ARENARIUM (F. C. Gates) Fernald in RHODORA xxxvii. 328 (1935). Many vigorous, sprawling plants on stony upper strand of Ponhook Lake; none in flower or fruit (7111). Seen only here and apparently not common anywhere in Nova Scotia. Represented in the Gray Herbarium from Lunenburg, Hants and Pictou Cos. Fernald's reports of *A. cannabinum* are to be referred here.

CUSCUTA GRONOVII Willd. On various herbs and shrubs, thickets along the Medway River at Mill Village (7122) and near the outlet of Ponhook Lake. Apparently rare in Nova Scotia: Macoun has a single report from Grand Lake, Halifax Co.; Fernald found it only in the Lahave valley, Lunenburg Co.

** GRATIOLA AUREA Muhl., f. LEUCANTHA Bartlett in RHODORA ix. 123 (1907). Forming small pure colonies on the pebbly strand of Ponhook Lake (7112). Reported by Pennell (Monog. Acad. Sci. Philadelphia i. 72 (1935)) from Delaware to eastern Massachusetts. A striking form, the corolla pure white except for a yellow tinge on the inside of the throat.

** UTRICULARIA INFLATA Walt., var. MINOR Chapm. Fl. so. U. S. 282 (1860). A single flowering individual in rather deep water of Ponhook Lake (7113). Not previously known east of Hancock Co., Maine. The report (of *U. inflata*) from "Lower Canada (Pursh.)" given by Macoun was an error; Pursh wrote "lower Carolina". Var. *minor* is, of course, the only phase of the species which occurs in the North.

UTRICULARIA SUBULATA L. Margin of the Medway River, Charleston (*Wessman*). Collected by the Gray Herbarium expeditions in Digby, Yarmouth and Shelburne Cos.

CEPHALANTHUS OCCIDENTALIS L. In abundance at Prof. Wetmore's station at Cameron Lake (7063; see RHODORA xxiv. 204) and at various points along the Medway as far down as Mill Village.

** SOLIDAGO SEMPERVIRENS L. forma **ochroleuca,** n. f., ligulis pallidissime flavis fere albis. Rays very pale yellow, almost white.— NOVA SCOTIA: scattered plants in a salt marsh, Parrsboro, Cumberland Co., Aug. 12, 1941, *C. A. & Una F. Weatherby* no. 7056, TYPE in Herb. Gray. MAINE: Isle au Haut, Sept. 12, 1916, *N. T. Kidder* (see RHODORA xix. 20 (1917)).

Similar pale-rayed forms, though far from common, are known in at least two other species of *Solidago*, *S. racemosa* (f. *leucantha* Fernald in RHODORA xx. 172 (1918)) and *S. flexicaulis* (Conn. Geol. Nat. Hist. Surv. Bull. xlviii. 83 (1931)).

SOLIDAGO TENUIFOLIA Pursh, var. PYCNOCEPHALA Fernald in RHODORA, xxiii. 293 (1922). On most lake-shores in the Medway valley (7096); one of the most characteristic species of such habitats.

Aster undulatus L. In a red-pine-bearberry-*Corema* barren (7084) and at border of dry woods, Greenfield. Previously reported from Nova Scotia only in the Lahave valley, where it was collected by Fernald & Long in 1921 and, according to Roland, by Macoun in 1910.

Rudbeckia hirta L. sens. lat. Brooklyn (*Wessman*); not seen by us.

Roland states that the species is common in the northern and central parts of the province and that nearly all the material he has seen belongs to var. sericea (T. V. Moore) Fernald. I did not check this point with regard to Wessman's specimen; but certainly no form of the species is at all generally established in the western counties.

Lactuca hirsuta Muhl. var. sanguinea (Bigel.) Fernald in Rhodora, xl. 481 (1938). Roadsides at border of dry, mixed woods near Lake Rossignol Reservoir (Sixteen-mile Lake) (7100) and Greenfield (7115). Apparently not reported east of Yarmouth and Shelburne counties.

Gray Herbarium

BETULA POPULIFOLIA IN VIRGINIA AND ITS VARIETY LACINIATA IN MASSACHUSETTS

Donovan S. Correll

(Plate 708)

While driving through Fisher's Gap (3061 ft. alt.) in the Shenandoah National Park, Madison County, Virginia, I observed several saplings of *Betula populifolia* growing with the shrubby vegetation which covers the poor, rocky soil at that point. Upon investigating further away from the roadside, a number of saplings were found scattered throughout the area. This is apparently the first report of the occurrence of *B. populifolia* in Virginia and represents the southernmost station known for this species. Gray's New Manual of Botany, 7th edition, gives the distribution of this species as from Prince Edward Island to Delaware, west to Lake Ontario.[1]

A plant of *B. populifolia* var. *laciniata* Loud. was found during the summer of 1941 in an old field in Auburndale, Massachusetts. The individual (Plate 708) consists of a cluster of several sap-

[1] Since this went into type a report of this species in Virginia was published in Castanea, 6: 103, 1941.

BETULA POPULIFOLIA var. LACINIATA in Massachusetts: left, habitat view; center, near-view of plant, partially defoliated; right, close-up of leaves.

lings and basal shoots from a single crown, the tallest sapling being about seven feet high, and is growing in a dense carpet of *Polytrichum commune* L. var. *perigonale* (Michx.) Bryol. Eur.

The old field, which was under cultivation apparently about fifteen years ago, is typical of many of the abandoned fields in this region. It is on the edge of a thick forest at the border of which is a dense stand of *B. populifolia.* A number of shrubs and young trees are scattered over the field, consisting mainly of *B. populifolia, Cornus Amomum, Quercus velutina, Q. alba, Populus tremuloides, Spiraea tomentosa* and *Prunus* sp. The most abundant herbaceous species found in the immediate vicinity of *B. populifolia* var. *laciniata* are *Lechea villosa, Helianthemum canadense, Festuca ovina, Aster vimineus, Solidago canadensis, S. rugosa, S. nemoralis, Phleum pratense, Gnaphalium obtusifolium, Aster cordifolius, Andropogon scoparius* and *Panicum* spp.

Variety *laciniata* is similar to the typical form of *B. populifolia* except for its deeply incised-laciniate leaves. The leaves, which are deltoid-ovate in outline, are truncate to broadly cuneate at the base and are deeply cut (to about two-thirds of the distance to the midrib) into three to seven lobes. The lobes are long-attenuate at the apex and are sharply and irregularly serrate-laciniate on the margins.

Variety *laciniata* has been known from cultivation since it was originally described in 1838, and perhaps before that time. However, so far as I know, it has never been reported as growing in the wild state. It is doubtless a mutation and should be looked for in nature.

Specimens from the above two stations have been placed in the Gray Herbarium and the Duke University Herbarium.

Botanical Museum, Harvard University.

The Scarcity of pink-flowered Gentiana Porphyrio.—In Bull. Torr. Bot. Club, lxviii. 662 (1941), arguing that the name *Gentiana Porphyrio* J. F. Gmelin, substitute for *G. purpurea* Walter, is rightly applied to the plant which commonly has deep azure-blue corollas, the plant I had called *G. Stoneana,* Dr. R. T. Clausen said "The most notable variation is in the color of the

flowers. These vary from deep blue to pink. I have seen the pink phase in the garden of Mrs. J. N. Henry, Gladwyne, Pennsylvania. These plants came originally from near Wilmington, North Carolina." From this phrase one might, with good reason, infer that its author knew "plants" with pink corollas. Consequently, yielding to Dr. Clausen's persuasion, I referred in Rhodora, xliv. 151 (1942), to "The discovery by Mrs. J. Norman Henry near Wilmington, North Carolina, as reported by Dr. R. T. Clausen in Bull. Torr. Bot. Cl. lxviii. 662 (1941), of pink-flowered plants growing with the typical azure-flowered plant."

Mrs. Henry, however, writing on May 21, 1942, corrects a misunderstanding.

"The fact is as follows:

In 1938 I ran across a large area that was dotted liberally with *Gentiana porphyrio*—the common blue type. As is my custom on finding a large group of any plant, I began to search for an albino. I had no luck with the pure white but I did find the pink . . . A long and careful search [any one knowing Mrs. Henry can be sure that the search was a thorough one] revealed that this was the only one of its color. There were no intermediate shades.

The plant was a young one with but one slender flower-stalk. I think its age could not have been more than three years. It has been growing in a pot in a cold frame ever since. This spring [1942] it had nine stems capable of flowering, so I ventured to divide it in two. I am glad to say that both plants are now thriving, one in a pot and one outside."

It is evident that I was in error in referring to Mrs. Henry's having found "plants" with pink flowers.—M. L. Fernald.

MISINTERPRETATION OF ATLANTIC COASTAL PLAIN SPECIES

M. L. Fernald

The Atlantic Coastal Plain of the United States, with its western extension, the Gulf Coastal Plain and its Mississippi Embayment, forms one of the most natural biogeographic areas of the country. Its position and extent are clearly shown in many of my own papers, as, for instance, in Rhodora, xxxiii. 26 (1931). Pennell on some of his published maps clearly outlines it; and it is recognized by W. T. McLaughlin in Ecological Monographs, ii. 339, fig. 1 (1932). It is, of course, definitely

described and shown on maps in all reliable treatises on the geology and physiography of North America, and books which every phytogeographer should have at his right hand are perfectly lucid in showing its limits and in discussing it: such books as Bowman's *Forest Physiography* and Fenneman's *Physiography of the Eastern United States.*

Nevertheless, many papers are published by botanists living far from the real Coastal Plain in which is apparent an amazing misinterpretation of its limits and of its very distinctive flora. Geologically and physiographically the Atlantic and Gulf Coastal Plain is the relatively flat marginal area which was covered by the border of the Cretaceous and then by the Tertiary seas; covered so deeply that the more ancient rock-formations, such as characterize the Piedmont and mountainous areas, were completely buried and show at the surface only at the inner edge of the Cretaceous and Tertiary beds. At the inner margin of the Atlantic Coastal Plain, which varies in breadth from only a few miles on Cape Cod, to from 25 to 65 miles in New Jersey, 100 to 125 miles in Virginia and the Carolinas, and up to 150 miles in Georgia, flat tongues of land, evidently ancient coves and inlets, covered with typical Coastal Plain deposits and vegetation, extend back among the Piedmont hills of hard and pre-Cretaceous rock. Where the Cretaceous or Tertiary marine deposits contain abundant fossil mollusca and bony skeletons the soils are highly calcareous. Where the deposits are of sand or clay they are commonly acid; and in areas of abundant shell-deposits millions of years of constant leaching have resulted in acid superficial soil.

The striking feature of the Coastal Plain (at least from New Jersey to Virginia), besides its low altitude, relatively shallow sculpturing and essential monotony of landscape over vast areas, is this abrupt change from acid to basic soils; a flat area, leached for 25,000,000 or more years and consequently supporting an oxylophytic vegetation, instantly giving way, where a stream has cut down a few feet into the marl-beds, to a pronounced calcicolous vegetation. Where lime is readily available the calcicolous plants of the Piedmont, the Appalachian Upland or even of the Mississippi Basin, long ago finding the region, have moved in: such characteristic species as *Ulmus fulva* (for map

see Hough, Handb. Trees, 189 (1907)), *Juglans cinerea* (l. c. 51), *Ptelea trifoliata* (l. c. 301), *Euonymus atropurpureus* (l. c. 323), *Acer Negundo* (l. c. 337), *Hydrangea arborescens, Menispermum canadense, Hexalectris spicata* (see Rhodora, xxxix. 343, map 18), *Leersia lenticularis* (l. c. 349, map 22), *Carex Grayii* (l. c. 343, map 19), *Trifolium reflexum* (l. c. xliii. 503, map 5), *Arabis canadensis, Thaspium barbinode, Campanula americana* (l. c. map 7), *Lobelia siphilitica* (see McVaugh, Rhodora, xxxviii. 280) and many scores more, with local pockets supporting *Hybanthus concolor, Athyrium thelypterioides, A. pycnocarpon* and, on hardened shell-marls, *Pellaea atropurpurea.* These and hundreds of other continental or inland types obviously should not be called primarily Coastal Plain species. Neither should the many plants of circumneutral to acid soils of the interior, which overlap upon the Coastal Plain: such species as *Pinus echinata* (see Hough, 15), *P. virginiana* (l. c. 17), *Carya alba* (l. c. 63), *Salix discolor* (l. c. 93), *Populus grandidentata* (l. c. 111), *Quercus palustris* (l. c. 143), *Rhus typhina* (l. c. 307), *R. Vernix* (l. c. 311), *Oxydendrum arboreum* (l. c. 373) and the host of shrubs and herbs which accompany them.

The true Coastal Plain plants are the species restricted to or primarily developed upon that distinctive area, mostly without but sometimes with a few and remote upland stations. These and their probable movement out from the ancient Appalachian (and Ozarkian) cores of the continent have been much discussed[1]; that problem need not now specially concern us. The extensive and very characteristic flora typical of the Coastal Plain contains many hundreds of thoroughly distinct species: such trees as *Pinus palustris* and *serotina, Taxodium distichum* (for map see Hough, 39), *Smilax laurifolia* and *Walteri, Carya aquatica* (l. c. 55), *Quercus laevis, virginiana* (l. c. 181) and *cinerea, Asimina parviflora, Persea palustris* (l. c. 219), *Xanthoxylum Clava-Herculis* (l. c. 299), *Cyrilla racemiflora, Ilex vomitoria* (l. c. 317), *Nyssa aquatica* (l. c. 367), *Rhododendron atlanticum, Leucothoe axillaris, Lyonia lucida, Zenobia pulverulenta* (see Rhodora, xlii. 378, map 16), *Vaccinium crassifolium* (l. c. map 12), *Fraxinus caroliniana* (Hough, 387) and scores of other trees and shrubs.

[1] See especially Fernald: *Specific Segregations and Identities in some Floras of Eastern North America and the Old World.* Rhodora, xxxiii. 25–63—Contrib. Gray Herb. xciii (1931).

These are accompanied by a tremendous series of herbaceous plants: *Sagittaria Weatherbiana* (see RHODORA, xxxix. 327, map 5), *Panicum hemitomon* (l. c. 343, map 14), *aciculare* (Hitchcock, Man. 622, fig. 1292), *ensifolium* (l. c. 646, fig. 1410), *leucothrix* (l. c. 632, fig. 1340), *Wrightianum* (RHODORA, xxxix. 327, map 13) and dozens more, *Sacciolepis striata* (Hitchc. Man. 688, fig. 1548), *Axonopus furcatus* (l. c. 573, fig. 1197), *Ctenium aromaticum* (RHODORA, xxxix. 327, map 11), *Manisuris rugosa* (Hitch. Man. 763, fig. 1687), *Eleocharis tricostata* (RHODORA xli. 471, map 4), *tortilis* (Svenson, RHODORA, xxxix. 246, map 15) and *vivipara* (l. c. 242, map 12), *Scirpus divaricatus* (Fernald, RHODORA, xxxix. 327, map 4), *Rhynchospora pallida* (l. c. xlii. 378, map 14), *R. Torreyana* (l. c. xxxix. 478, map 32) and two dozen more, *Cladium jamaicense,* numerous *Carices, Xyris flexuosa* (*arenicola*), *ambigua, platylepis, fimbriata* and *Curtissii. Eriocaulon decangulare* and *compressum, Juncus abortivus* (l. c. 349, map 28), *caesariensis* (l. c. 327, map 1), *Elliottii, Longii* and others, *Tofieldia racemosa, Zigadenus glaberrimus, Aletris aurea, Hypoxis leptocarpa* (l. c. map 7), *Zephyranthes Atamasco, Burmannia biflora* (l. c. xli. 471, map 7), *Habenaria nivea, integra* and *cristata, Calopogon pallidus* (l. c. xlii. 378, map 13), *Arenaria caroliniana* (l. c. xxxix. 349, map 29), *Drosera filiformis* (l. c. xxxiii. 55, map 29), *Micranthemum umbrosum* (l. c. xxxix. 327, map 8), *Lobelia elongata* (McVaugh, RHODORA, xxxviii. 286, fig. 8), and hundreds more. THESE REPRESENT THE ATLANTIC COASTAL PLAIN FLORA.

The true members of the Atlantic Coastal Plain flora are rarely found off the Coastal Plain; it is they which give individuality to the region. Only a very small number of them occur in the region of the Upper Great Lakes: *Panicum verrucosum* (Hitchc. Man. 682, fig. 1537), *lucidum* (l. c. 630, fig. 1333) and *mattamuskeetense* (l. c. 627, fig. 1317), *Eleocharis melanocarpa* (Svenson, RHODORA, xxxix. 270, map 22), *Psilocarya scirpoides* and *nitens, Fuirena pumila, Rhynchospora corniculata* and some others. Unfortunately, however, it is coming to be the fashion for some botanists of the north-central states to assume that almost any plant occurring east of Lake Michigan, and especially from east of the Alleghenies or the uplands of central-western New York and Pennsylvania, is a Coastal Plain species; and their papers

on "Atlantic Coastal Plain Plants in the Flora of" Here-and-There record common Canadian, northern Piedmont, transcontinental and even circumboreal species as belonging primarily to the "Atlantic Coastal Plain." In the cases where such plants actually are on the true Coastal Plain, they are there merely as part of a broad continental range and their presence there is of no dramatic importance; and when the authors cite as "Atlantic Coastal Plain" types plants which occur in Britain, Sweden, Russia, Siberia, Alaska, Washington, Idaho, Saskatchewan, the Hudson Bay Region, the Laurentide Region, Labrador and Newfoundland (or in some of these areas) one becomes quite discouraged over the future of phytogeography in the hands of such wishful thinkers.

Somewhat against my own will I have yielded to the insistence of others who have been troubled by the same loose designation of wide-ranging inland plants as significant species of the Atlantic Coastal Plain and with me have felt that, in the interest of more exact phytogeography, such errors should be noted. Only some of the cases which have recently come to my attention are here recorded; they are sufficient to indicate where clearer thinking and more accurate tabulation are important.

Lycopodium inundatum. Originally described from Europe, typical *L. inundatum* is characteristic of acid peats and wet sands of that continent and of cool-temperate to Canadian North America: abundant in Newfoundland (including the highest tablelands) and the Maritime Provinces of Canada, thence across Quebec and northern Ontario to Thunder Bay District (north of Lake Superior), it also occurs in Alaska, British Columbia, Washington, Oregon and Idaho. In the East, typical *L. inundatum* extends south to southern New England, southern New York, New Jersey, Pennsylvania, the Allegheny Mts. of Virginia, West Virginia, northern Ohio, northern Indiana, northern Illinois and Minnesota. Of the more than 2,000,000 square miles of territory in Europe and North America in which it is known less than 10,000 square miles are on the Atlantic Coastal Plain, 1,990,000 square miles inland from the Coastal Plain or in Pacific America or Europe.

Muhlenbergia uniflora. Very abundant in acid peats, sterile meadows, and on damp shores, etc., from Newfoundland and the southwestern part of the Labrador Peninsula to Thunder Bay District (north of Lake Superior), Ontario, south to Nova Scotia, southern New England, Long Island, New Jersey, Michi-

gan and Wisconsin; less than 1 *per cent* of its area being on the Atlantic Coastal Plain. Had the map in Ecol. Mon. l. c. 345, fig. 10, contained more dots in Newfoundland, Nova Scotia, northern New England, and some on the Labrador Peninsula, in Quebec, the Adirondack region and the Thunder Bay District, the essentially boreal range would have come out.

STIPA AVENACEA. Wide-ranging in sufficiently dry and sterile soils (Hitchcock says "Dry or rocky open woods") through most of the eastern United States, northward to Massachusetts, New York and Michigan. Dry open woods abounding on the Coastal Plain, it naturally occurs there, just as it does "on top of Buzzard Mountain" in interior Virginia, on dry hills near Biltmore in the Carolina Mountains, on Pine Mountain, Georgia, or on the Cumberland Plateau or on "dry ridges, near Knoxville", Tennessee.

ECHINOCHLOA WALTERI, growing in basic waters and sloughs, naturally enough is along the coast, especially on somewhat brackish tidal shores; it rarely extends inland on the Coastal Plain, but it follows tidal shores within the Piedmont area; and in appropriate habitats occurs inland in New York, Ohio, West Virginia, Kentucky, Indiana, Michigan, Wisconsin, Illinois, Iowa and Missouri. It is as much *off* as *on* the Coastal Plain. The map in Ecol. Mon. ii. 341, fig. 4 (1932) gives stations only along the Atlantic margin and from the lake region of New York to Wisconsin; Hitchcock, Man. fig. 1560, has a more accurate picture of the range.

ELEOCHARIS PAUCIFLORA, var. FERNALDII. Svenson's map in RHODORA, xxxvi. 384 (1934) gives a vivid picture of the range: Newfoundland and adjacent Labrador Peninsula to James Bay and to Lake Nipigon, Ontario, south to Cape Breton Island, Nova Scotia, calcareous ledges of northern Maine, northernmost New Hampshire (north of the White Mountains), mountains of northeastern Vermont, northern and western New York, northwestern Pennsylvania, northern Indiana, northern Illinois and northern Iowa. Its inclusion in Papers Mich. Acad. Sci. Arts and Lett. xxvii. 41 (1942) must have been due to the misconception which classed several other wide-ranging species as of the Atlantic Coastal Plain. *E. pauciflora*, found nowhere on the Coastal Plain, occurs in northern and cool areas of Eurasia, in Greenland, and in western North America from Great Slave Lake and the Canadian Rocky Mts. south to New Mexico, Arizona and California; also in the Andes. It is typically circumboreal, with an embarrassing Andean relationship.

E. ROSTELLATA is halophytic; consequently, having found the sea-margin of the Atlantic, it follows it (from Nova Scotia to the Greater Antilles). Its largest region, however, is in alkaline areas from southwestern Canada to Oklahoma, Texas, Mexico

and southern California (see Svenson, Rhodora, xxxvi. 385, map 2). There it is of broad continental dispersal. On the Atlantic Coastal Plain it is merely where the saline Atlantic waters lap the shore! That is, however, simply because it is a rather typical American halophyte.

Hemicarpha micrantha. The map in Ecol. Mon. l. c. fig. 2 indicates Atlantic Coastal Plain stations on Cape Cod, Long Island, possibly New Jersey and Maryland, and in southern Florida and Alabama; but it shows nothing from Maine, central New Hampshire, eastern New York, Ontario, Ohio, Virginia, central Kentucky, Nebraska, Kansas, Wyoming, Colorado, New Mexico, eastern and northern California, Oregon, Washington, the tablelands (up at least to 3000 feet) of Mexico and Central America, to say nothing of 25 degrees of latitude in South America, all of which would have materially changed the picture (for more accurate map see Friedland, Am. Journ. Bot. xxviii. 858 (1941)).

Rhynchospora fusca, originally described from Sweden, England and Italy, characterizes bogs, wet peats and wet sands of Europe, just as it does in North America, from Newfoundland to Algoma District, Ontario (often ascending to mountain-ponds at 1500–3000 feet). Southward it reaches Delaware and Michigan. It is a typical boreal plant.

R. alba. Still more boreal—circumboreal, found in Europe and Siberia; and in America in many areas from Alaska to California and Idaho; and from northern Ontario to southeastern Labrador and Newfoundland, thence south to Minnesota, Illinois, Indiana, Ohio, Pennsylvania, the Carolina Mountains, New Jersey, Long Island, New England and Nova Scotia. A typical circumboreal plant of acid peats, etc.

Carex exilis. Eastern Labrador to James Bay, south to Newfoundland, Nova Scotia, Maine (very local), Massachusetts, Rhode Island, Delaware, New York, southern Ontario and Michigan. On the Coastal Plain only in New Jersey and Delaware, as an intrusion from the north, like so many species which were clearly understood by the late Witmer Stone (Pl. So. N. J. 49), a biogeographer whose caution, accuracy, clear thinking and modesty it would be a comfort to see more frequently emulated: such plants as *Lycopodium inundatum* (see above), *Schizaea pusilla* (for map see Rhodora, xxxv. 86, map 7), *Potamogeton confervoides* (for map see Fernald, Mem. Am. Acad. xvii. 33, map 1), *Scirpus subterminalis, Carex limosa, Eriocaulon septangulare* (see below), *Juncus articulatus* (see below), *J. pelocarpus* and *Aster nemoralis* (for map see Rhodora, xxii. 94, map 3).

C. Richii. When Mackenzie elevated this plant to specific rank (Bull. Torr. Bot. Cl. xlix. 362 (1922)) he enumerated all the specimens examined, all (I believe) from inland beyond the Coastal Plain.

Eriocaulon septangulare. A famous and often cited trans-Atlantic species (see Proc. Internat. Congr. Pl. Sci. ii. 1505, map 40). Originally described from western Scotland, the plant is known in various parts of Ireland. The map referred to could now be somewhat extended by dots in the mountains of Virginia and some from farther north; and the inclusion on map 20 of the paper in Ecological Monographs of all of Newfoundland, Nova Scotia, New Brunswick, the Laurentide region, etc. and the omission of the dot in southern Georgia would help clarify the situation.

Juncus Greenei, to be sure, is on the Coastal Plain of Massachusetts and Long Island, becoming very local in New Jersey, but its great development eastward is on the sterile and rocky Piedmont area and on the mountains from Nova Scotia to eastern New York. Although it abounds on sand dunes and plains mostly north of the Coastal Plain, it is a regular inhabitant of arid siliceous and granitic hills and lesser mountains of southern and southwestern Maine and adjacent New Hampshire, the following data taken from labels before me: "granitic soil, top of Mt. Waldo, Winterport, and cliffs, Indian Hill, Belfast"; "ledgy summit of Mt. Megunticook, Camden", "dry hilltops, East Auburn"; "very common on dry mountain sides, Cornish"; "ca. 3500 ft.", Mt. Washington; "Mt. Washington Carriage-road, 3800 ft."; "summit of Mt. Belknap, 2259 ft. alt., Gilford"; "summit of Pack Monadnock". No one who has stood on these New England mountain-tops or who has followed the carriage-road, hewn in solid rock, to 3800 feet on Mt. Washington, has imagined himself on the "Atlantic Coastal Plain".

Juncus balticus, var. littoralis. *J. balticus*, from its specific name obviously described from northern Europe, is a polymorphous, amphigean, more or less halophytic type, separated on not too convincing characters into many so-called geographic varieties. The broad range of the species includes alkaline regions of much of the cooler part of the Northern Hemisphere, with an extension down the Andean region to Patagonia. Var. *littoralis* occurs from Labrador to Hudson Bay and northwestward at least to the Mackenzie Basin, with extensions southward to southern New York, Pennsylvania, the Great Lakes States, Nebraska, etc. Stone did not include it in his *Plants of Southern New Jersey*. Probably not one-fourth of 1 *per cent* of its southeastern extension in North America is on the Atlantic Coastal Plain.

It is needless (I fear futile) to discuss in detail scores of additional cases: such amphigean plants as *Juncus articulatus* and *Drosera intermedia;* or such eastern American ones as *Melampyrum lineare,* var. *latifolium,* clearly shown by Pennell (Scroph. E. Temp. N. A., map 148) as chiefly inland from the Coastal Plain, with a long tongue following the Alleghenies from Penn-

sylvania to Georgia, or *Gerardia paupercula* which is characterized by Pennell (see his map 114) as follows: "This species occurs wholly in glaciated territory, excepting for the occurrence in southeastern Pennsylvania . . . and . . . the unglaciated area of Wisconsin". He knew better than to call it a Coastal Plain type.

It is evident that too many botanists with limited outlook over the continent or the world have made the mistake of thinking in ecological rather than phytogeographic terms; to them any plant of sphagnum-bogs, peats and acid sands, as well as of salt marshes, would seem to be a plant of the Atlantic Coastal Plain. Until they study and understand the real Coastal Plain and its really distinctive flora such groundless but well-intended generalizations about them will be wholly misleading. Unfortunately, as I have been forced to write before, such work "contains so many assumptions that it must be classed as another addition to our too extensive mass of publications in which the tremendously interesting facts of distribution are replaced by vague and unsupported statements. That so many authors dealing with phytogeography are content to draw their deductions from inaccurate data is amazing, for, in this subject as in all others, as Byron long ago asserted, 'truth is always strange,—stranger than fiction'." Still more unfortunately, "errors once born never die but, on the contrary, by others not situated to know the facts are continually mistaken for the truth and consequently perpetuated," especially when they emanate from distinguished universities and academies. Erroneous matter thus formally published can not be blacked out!

Nematode Infection in Poa.—On the examination of plants of *Poa pratensis* from the matted mossy sward of an old hill pasture near the town of Antigonish, Nova Scotia, the variation in the size and appearance of the spikelets in the same panicle was found to be due to infection of some with nematode worms. The larger and greener spikelets had the grains filled with soft material composed of numerous eggs and larvae. The lemmas of such infected spikelets were 4.5–5.0 mm. long with 5 distinct and generally 2 or 4 additional less distinct nerves and were broad

enough to completely enclose the palea and the long (3.0–4.5 mm.), smooth, purple body representing the caryopsis. When all florets of the spikelet were infected the spikelet was 5.5–6.5 mm. long. The palea in some was normal, but in others it was represented by a 1- to several-nerved scale lacking in ciliation and, in all cases, quite free from the caryopsis. The glumes, particularly the second, were 3-nerved.

Normal spikelets are 3–5 mm. long with lemmas 3 mm. long, distinctly 3-nerved with 2 additional fainter intermediate nerves. The grain is plump, broad-elliptical, 2 mm. long, farinaceous, brownish and somewhat adherent to the palea.

In plants severely parasitized, the panicles are very much reduced in size with the few spikelets on stiff and short branches.

Fig. 1, lemma and caryopsis of normal spikelet of P. pratensis. Fig. 2, lemma and caryopsis of infected spikelet from same panicle. Fig. 3, lemma and caryposis of P. costata (infected). All figures × 5.

Such plants compare fairly well with specimens of *Poa costata* Schumacher collected by members of the Gray Herbarium Expedition in Nova Scotia in 1920 and 1921 (Rhodora **23:** 133, 231, 1921). A dissection of specimens in the National Herbarium of Canada, however, showed all to be infected with the nematodes and to possess morphological characters essentially the same as in infected spikelets of *P. pratensis*, as mentioned above. Although it cannot be said with certainty, it appears quite probable that these plants that have been passing as the rather rare *P. costata* of the Baltic, Newfoundland, Prince Edward Island and Nova Scotia may be, in reality, diseased states of the common *P. pratensis* or some other local species. A parallel case is frequently met with in *Agrostis tenuis* Sibth., the disease-modified plants having been given distinct specific or varietal names in the past (see Philipson, Jour. Bot. LXXIII: 65–74, 1935).—W. G. Dore, Dalhousie University, Halifax.

Some New Records of Spermatophytes from Missouri.—During the last two collecting seasons, a number of Flowering Plants which appear to be new records for the state have been added to the Herbarium of the University of Missouri. For purposes of record, therefore, publication of these collections seems desirable.

Falcaria sioides (Wibel) Asch. (*Falcaria vulgaris* Bernh.), growing in considerable abundance along a fence-row in bottomland soil on the roadside between Hartsburg and Welton, Boone County, was first observed and collected (VII/20/40) by Mrs. Grace Ernst Miller whose identification I have verified at the Gray Herbarium. It may well be more than a coincidence that this plant, native to central Europe, has become established in a neighborhood where many of the early settlers came from Germany. In this locality in Missouri the plant appears to have been established for a considerable period of years.

Veronica didyma Ten., growing on moist soil of bottomland woods, was collected on the Drury Wildlife Refuge, Taney County, by Mr. D. Spencer (III/27/41). My identification was verified personally at the Gray Herbarium.

Liatris scariosa (L.) Willd., f. *Benkei* Macbride, the rare white-flowered form of this Liatris, was collected by myself (IX/17/40) in an upland prairie relict, paralleling the tracks of the Burlington and Wabash Railroads and State Highway 22, about three miles east of Centralia, Audrain County. Despite further diligent search of many prairie relicts in central Missouri, no other white-flowered plants of this species were found, although numerous white-flowered individuals of *Liatris pycnostachya* Michx. have been observed annually in the same general area.

Carduus nutans L., found growing as a weed in a field near Palmyra, Marion County, was collected by Mr. C. G. Tarleton (VI/9/41). For verifying my determination, I am greatly obliged to Mr. C. A. Weatherby.—William B. Drew, University of Missouri, Columbia, Mo.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXLI

A LIST OF TYPE SPECIMENS IN ELLIOTT'S HERBARIUM

C. A. Weatherby

No taxonomist needs to be told that Stephen Elliott's "Sketch of the Botany of South Carolina and Georgia" is a classic in its field, and most of us know that his herbarium is preserved in the Charleston Museum. Some of us have seen it, or parts of it. But there is no published account of its present condition; prospective visitors cannot readily learn in advance whether or not it still contains the material in which they are especially interested; and had it met with any fatal accident there would have been no record of what it had included. With all this in mind, my wife and I visited Charleston in October, 1941, and, through the courtesy of the Director of the Museum, Mr. E. Milby Burton, and his staff, were enabled to go through the whole herbarium and list and photograph the surviving types. The results of our labors are here published, in the hope that they may be of use to future investigators.

The Elliott herbarium, like the Museum itself, has had its vicissitudes. I have not been able to discover at what date it came into the possession of the Museum, but notes accompanying the specimens show that it was accessible to, and consulted by, Gray, Ravenel and Stephen Olney well back into the nineteenth century. At the time of Elliott's death (1830), the Museum seems to have been in a rather quiescent state and to have

remained so until 1850. That was the time of Gibbes and his associates; in that year, the American Association for the Advancement of Science met in Charleston, with Agassiz as one of its leaders. The result was a considerable revival of local interest in natural history and in the Museum, its transfer to rooms in the library building of the College of Charleston and the appointment of an active curator, Mr. F. S. Holmes. Progress, however, was interrupted by the Civil War. During the siege of Charleston, such of the Museum exhibits as would stand that treatment were buried; the more fragile were moved into the country, where some of them were burned by Sherman's raiders. The Elliott herbarium escaped, only to fall into the hands of one of those curators who does excellent work in his own subject and is careless—and often contemptuous—of everything else.[1] When, in the last decade of the nineteenth century, F. L. Scribner and later E. D. Merrill went to look up Elliott's grasses, they found the herbarium stored casually against a damp brick wall, a prey to mould, mice and insects. According to an article in the Charleston Evening Post for March 30, 1905, sixteen portfolios were first discovered, then four more and the twenty-first finally unearthed in 1905, in a pile of waste paper about to be burned.[2]

Under the direction of Prof. George Hall Ashley and his successor as curator, Prof. Paul M. Rea, the whole herbarium was sent to Biltmore, then at the height of its botanical activity, to be cleaned, poisoned, generally put in order and safely stored. All this was faithfully and intelligently done by Messrs. Beadle and Boynton. They also determined all the specimens according to Small's Flora, not always very critically but for the most part helpfully, and indicated the types of such species as were maintained by Small under Elliott's original names, but no others. They were to have published an account of the herbarium and did prepare a partial manuscript catalogue, but this part of their work was never finished.

[1] There is perhaps no surer mark of the true scholar than respect for work in other disciplines than his own, unfamiliar to him. In this connection, a word of public commendation is due those librarians and faculty members of Hamilton College who, though not themselves botanists, have kept the locally important herbarium of Sartwell, acquired about 1860, to this day in as good condition as when it was received.

[2] Evidence as to the original number of portfolios is conflicting. Scribner, reporting on the results of his and Merrill's examination of the grasses in U. S. Dept. Agric. Div. Agrost. Circular 29 (1901), states that there were twenty-eight volumes. The writer in the Post says twenty-one.

Rea refused to ask for the return of the herbarium until he could give it proper storage. About 1908 he acquired a large safe; the herbarium was then brought back to Charleston and has since had good care. When I first saw it in 1932 it was still in the safe. It is now kept in a steel-sheathed case, originally designed for bird-skins and therefore not altogether convenient for herbarium specimens, but dust- and insect-proof. Any benefactor who might be moved to give the Museum a good steel herbarium-case for the Elliott specimens would do a service to taxonomy.

Beadle and Boynton did not alter Elliott's arrangement, said to have been alphabetical; in 1913–16, however, the Museum staff rearranged the specimens in the sequence of Small's Flora, in the process discarding Elliott's portfolios and substituting modern genus-covers. The individual specimens, however, are still in the gray paper folders of various sizes which Elliott used, pasted or stripped to the inner pages. Labels are on slips about one by two inches, often slit to permit stems to be thrust through them, and usually pasted down across the bases of the specimens. They are very neatly and legibly written and usually give data of habitat and the name of the collector, if other than Elliott.

Naturally, the herbarium shows obvious signs of past misfortune. There is a good deal of breakage and insect damage; some specimens have no labels; many others have disappeared, leaving only labels or fragments of labels to represent them; many, including all the *Juncaceae*, are missing altogether. But it is a pleasure to be able to record that most of the surviving types, though often fragmentary, are in good condition.

The list which follows aims at nothing more than a catalogue of Elliott's existing types, which, with the photographs, may serve as a useful record in case of accident to the originals. It is not wholly complete; I may have missed a few Elliott types[1] and I found myself unprepared to deal with whatever representatives there may be of the forty-odd species of Muhlenberg's Catalogue first published with descriptions by Elliott. But so far as it goes, the list should give a correct statement. Elliott's names are listed alphabetically, with the volume and page of the

[1] Scribner, in the report above cited, speaks as if he had seen some specimens which I did not find.

Sketch on which each appears and with the statement of habitat on the label—not always the same as that in the Sketch. It is, of course, to be understood that in the case of names not in the list, no type material was found; and it will be at once apparent that missing types are mostly in groups, like the *Compositae*, most liable to attack by insects. I attempted little in the way of critical determination, but the determinations of others, taken either from the folders or from literature when, as in the case of Hitchcock's Manual, the authors had presumably seen the type specimens, are freely given, as guides at least to the approximate position of the species. Fortunately, Elliott's descriptions are good and seem not to have been much misunderstood; and interpretations were verified through the loan of part of the herbarium to Torrey. As in my notes on Desvaux's types, I have indicated by small capitals under each species, where there are synonyms, the name which appears most likely to be nomenclaturally and taxonomically correct. Names of those making the determinations, or otherwise responsible for the taxonomic placing of species, are added in parentheses. The abbreviation "B. & B." indicates Beadle & Boynton: where the phrase "a cover marked . . ." is used, reference is to Elliott's original folders

Sets of our photographs have been deposited at the Gray Herbarium, the United States National Herbarium and the New York Botanical Garden.

It may be added that the Elliott herbarium contains isotypes of three species of Rafinesque—*Aristida geniculata*, *Polanisia graveolens*, and *Spiraea obovata*. It has also isotype material of *Psoralea floribunda*, *Petalostemum decumbens*, *Crypta minima* and *Monarda aristata* of Nuttall. Elliott isotypes are to be found in the Torrey herbarium at New York and presumably in the herbaria of Muhlenberg and Schweinitz at the Philadelphia Academy.

The historical matter here used is taken mostly from a series of articles by William G. Mazyck in the Bulletin of the Charleston Museum. I am indebted to Prof. M. L. Fernald for generous aid in determining identities.

Agrostis arachnoides Ell. i. 134. A loose specimen, without label, in a cover marked "Agrostis arachnoidea" is to be taken as type. A. Elliottiana Schult., a name based on *A. arachnoides* Ell., not *A. arachnoidea* Poir.

Agrostis trichopodes Ell. i. 135. "Hab. Georgia in aridis. Flor. autumn. Dr. Baldwin". The number 437 on a separate slip. MUHLENBERGIA EXPANSA (Poir.) Trin. (Hitchcock).

Aira triflora Ell. i. 153. "Hab. Athens, Geor. Flor. April. Mr. Green". POA CUSPIDATA Nutt. (Hitchcock).

Ammi costatum Ell. i. 350. "Hab. in inundatis, Ogeechee. Flor. Sept. Nov." Specimen in flower only. PTILIMNIUM COSTATUM (Ell.) C. & R.

Andropogon ciliatus Ell. i. 144. "Hab. in aridis juxta Beaufort. Flor. Sept." SORGHASTRUM NUTANS (L.) Nash (Beadle & Boynton; Hitchcock).

Andropogon tetrastachyus Ell. i. 150. "Hab. in humidis juxta Charleston. Flor. Sept. Oct." *A. virginicus* L. (Hitchcock); A. VIRGINICUS var. TETRASTACHYUS (Ell.) Hack. (Fernald & Griscom).

Andropogon vaginatus Ell. i. 148. "Flor. per aut. in aridis". A. VIRGINICUS (Scribner & Merrill; Hitchcock).

Apogon humilis Ell. ii. 267. Specimen without label in cover marked "Apogon humilis" and answering to the description should be taken as type. SERINIA OPPOSITIFOLIA (Raf.) Ktze. (B. & B.)

Arenaria diffusa Ell. i. 519. "Hab. in humidis. Flor. Ma.–Jul." On another label "35. Micropetalum. See letters". A. LANUGINOSA (Michx.) Rohrb. The specimen is a single branch or stem with two flowers.

ARISTIDA GRACILIS Ell. i. 142. Specimen without label in cover marked "Aristida gracilis" and agreeing with description should be taken as type.

ARISTIDA SPICIFORMIS Ell. i. 141. "Flor. aut. mihi rara. in Pineto juxta Silk Hope, Chatham Co., Georgia".

Asclepias angustifolia Ell. i. 325. "Habitat in pinetis humidis. Flor. Maio." A. MICHAUXII Decsne. (B. & B.)

Aulaxanthus ciliatus Ell. i. 102. "Hab. in aridis. Flor. Oct." ANTHAENANTIA VILLOSA (Michx.) Beauv. (Scribn. & Merrill; Hitchcock).

Aulaxanthus rufus Ell. i. 103. Label bears no data except the name and number 523. ANTHAENANTIA RUFA (Ell.) Schultes.

BOLTONIA DIFFUSA Ell. ii. 400. A cover marked *Boltonia diffusa* contains a specimen without label, consisting of a panicle without leaves and with one or two remnants of flowers.

BRICKELLIA CORDIFOLIA Ell. ii. 290. Two feet of stem, one involucre in situ, detached portions of half-devoured leaves, and some loose achenes are all that remain to represent this new genus and species. The specimen has lost its label, but agrees, as far as it goes, with the description and is in a cover marked "Brickellia cordifolia".

Cacalia atriplicifolia var. *angulata* Ell. ii. 310. A battered specimen labelled "Cacalia Hab. St. Thomas and St. Denis. Mr. Caradeux" and in a cover marked with the varietal name no doubt represents this.

Calopogon pulchellus var. *graminifolius* Ell. ii. 499. Three loose specimens without labels in cover marked with the varietal name, no doubt represent this. They are C. BARBATUS (Walt.) Ames (D. S. Correll).

Calycanthus inodorus Ell. i. 576. "Hab. in humidis. Fl. Apr. Mai." C. NANUS (Loisel.) Small (B. & B.).

Carex castanea Ell. ii. 546. "Carex Hab. in udis, Ogeechee. Flor. Aprili". Olney added to the label (he says in attached note inadvertently) "Elliottii". C. ELLIOTTII Schwein. & Torr., based on *C. castanea* Ell. not Wahlenb.

CAREX GLAUCESCENS Ell. ii. 553. Type not found. For the proper application of the name, see Mackenzie in Small, Fl. se. U. S. ed. 2, 1324 and Weatherby & Griscom in RHODORA xxxvi. 40.

COLLINSONIA PUNCTATA Ell. i. 36. "Hab. in umbrosis. Flor. Sept. Oct."

Collinsonia verticillata Baldw. ex Ell. i. 36. "Hab. Milledgeville Geor. Dr. Boykin". MICHELIELLA VERTICILLATA (Baldw.) Briq. No specimen of *C. verticillata* var. *purpurascens* Ell. was found.

Coreopsis Oemleri Ell. ii. 435. A specimen labelled merely "found in S. Carolina by Mr. Oemler" and determined as "*C. major Oemleri* (Ell.) Britton" by B. & B. probably represents this species. C. MAJOR var. OEMLERI (Ell.) Britton (Sherff).

Cyperus mariscoides Ell. i. 67. There is a specimen so labelled, but it is from North Carolina, coll. Schweinitz. It is *C. filiculmis.*

Cyperus repens Ell. i. 69. "Hab. in cultis circa Charleston. Flor. Aug.–Oct." C. ESCULENTUS L. (B. & B.)

CYPERUS TETRAGONUS Ell. i. 71. Name only and number 83 on label.

DICHROMENA LATIFOLIA Baldw. ex Ell. i. 90. A specimen labelled with an unpublished name and "hab. Geor. Dr. Baldwin" agrees with the description and no doubt represents this species.

Dracocephalum obovatum Ell. ii. 86. "Hab. St. Mary's, Georg. Dr. Baldwin" and on a separate slip the number 197. PHYSOSTEGIA **obovata** (Ell.) R. K. Godfrey in herb., n. comb.

Drosera foliosa Ell. i. 376. "Hab. Chesterfield Co. So. Car. Dr. Macbride". D. INTERMEDIA Hayne with elongated axis, presumably from growing in water (f. NATANS Heuser).

Elephantopus nudicaulis Ell. ii. 481. Specimen in cover marked with this name, without label but agreeing with description, should be taken as type. E. TOMENTOSUS L. (B. & B.)

Erianthus contortus Ell. i. 40. There is a cover labelled *E. contortus*, but the specimen within, labelled "Erianthus brevibarbis Mich. Hab. in humidis. Flor. Sept. Oct.", does not agree with the description.

ERIANTHUS STRICTUS Baldw. ex Ell. i. 39. Specimen without label, determined as *E. strictus* by B. & B., may be taken as type.

Eryngium Plukenetii Ell. i. 582. Type not found. The figure of Plukenet cited may, of course, if identifiable, serve as type.

EUPATORIUM PINNATIFIDUM Ell. ii. 295. Specimen without leaves and without label, in cover marked "E. pinnatifidum", has been designated as type by B. & B.

EUPATORIUM SCABRIDUM Ell. ii. 299. "Flor. Oct. in sylvis subaridis. 157".

EUPHORBIA CORDIFOLIA Ell. ii. 656. Type missed by me, but seen by Fernald and reported upon by him in RHODORA xliii. 198 (1941).

EUPHORBIA PANICULATA Ell. ii. 660. "Hab. juxta Columbiam, So. Car. Flor. Aug. Sept." Three segments of stem, one cauline leaf and a branch bearing an inflorescence are all that is left of the type.

Festuca parviflora Ell. i. 170. "Hab. in pinetis Car. Flor. Apr. Mr. Bennett." F. OCTOFLORA Walt. (Hitchcock).

Fuirena hispida Ell. i. 579. "Hab. Milledgeville, Geor. Dr. Boykin." According to Fernald, RHODORA, xl. 397, *F. hispida* Ell. is the same as true F. SQUARROSA Michx.

GERARDIA FASCICULATA Ell. ii. 115. "Hab. in humidis insularum mar. Flor. Jun.-Sept."

Gerardia Plukenetii Ell. ii. 114. Pennell has designated as type a loose specimen without label in cover marked "G. Plukenetii". It agrees with Elliott's description; Pennell considers it G. SETACEA Walt.

Glycine mollisissima Ell. ii. 235. "Hab. St. Mary's, Geor. Dr. Baldwin". The label of what I take to be the type specimen bears no name, but the data are those given in the Sketch. *Dolicholus mollisissimus* (Ell.) Vail. RHYNCHOSIA MOLLISSIMA (Ell.) S. Wats.

GRATIOLA MEGALOCARPA Ell. i. 16. No specimen seen. The name, however, is based on *G. acuminata* sensu Pursh, not Walter, and Pennell (Mon. Phil. Acad. i. 92) has therefore typified it by a Pursh specimen, extant in the herbarium of the Philadelphia Academy.

Hypoxis filifolia Ell. i. 397. "Flor. Apr. in aridis, Ogeechee Ferry". H. JUNCEA Sm. (B. & B.)

Ipomoea orbicularis Ell. i. 257. "Hab. in arenosis maritimis, Cumberland. Flor. per aetatem. Dr. Kollock." I. PES-CAPRAE (L.) Sweet (B. & B.)

Lathyrus pusillus Ell. ii. 223. "Hab. St. John's juxta Cooper R. Flor. Mars. Dr. Trescott."

Lechea villosa Ell. i. 184. "major Mich. nec L. Flor. per aet. in pascuis aridis ubique." The type is a small specimen with a long basal branch.

Liatris Walteri Ell. ii. 285. A mixed sheet, with heads apparently of *L. scariosa* and leaves answering to Elliott's description, may partly represent this. Label: "Hab. in aridis juxta Beaufort. Flor. Sept. 323" Carphephorus tomentosus (Michx.) T. & G. (Gray) var. Walteri (Ell.) Fernald in Rhodora xlii. 481 (1940).

Lindernia refracta Ell. i. 579. "Hab. in sphagnis, Barnwell Co. So. Car. Flor. Aug."

Ludwigia cylindrica Ell. i. 213. "Hab. in aquosis juxta Beaufort. Flor. Aug. Sept." L. glandulosa Walt. (B. & B.)

Ludwigia lanceolata Ell. i. 213. A specimen labelled "Ludwigia Hab. in humidis. Dr. Baldwin" is indicated as type by B. & B. and agrees with the description.

Ludwigia natans Ell. i. 581. Specimen without label, in cover marked "*L. natans*" and agreeing with the description, is designated as type by B. & B.

Ludwigia sphaerocarpa Ell. i. 213. "Hab. in humidis juxta Orangeburg, So. Car. Flor. Aug."

Lycopus angustifolius Ell. i. 26. Fernald has suggested as type material two loose specimens in cover marked *Lycopus americanus* and with no label except that someone has written "Lycopus americanus M" "96" on the inside of the cover. These plants agree with the description.

Lycopus sinuatus Ell. i. 26. Specimen in cover marked *Lycopus sinuatus*, with a loose label reading "Lycopus europaeus? Hab. in aquosis Ogeechee. Flor. Oct. Nov." is apparently the type. The leaves, as described, are very deeply cut with long, narrow segments. L. americanus Muhl.

Lysimachia Herbemonti Ell. i. 232. "Hab. Columbia, S. Car. Mr. Herbemont." L. asperulifolia Poir. (B. & B.)

Lythrum lanceolatum Ell. i. 544. "Hab. in humidis. Flor. Jun. Jul."

Mariscus cylindricus Ell. i. 74. B. & B. have marked an unlabelled specimen, accompanied only by the number 351, as this species. It agrees with the description and should probably be taken as the type. *Cyperus Torreyi* Britton, based on *M. cylindricus* Ell., not *C. cylindricus* Chapm. C. retrorsus, var. cylindricus (Ell.) Fern. & Grisc.

Micranthemum emarginatum Ell. i. 18. "Hab. in aquosis. Flor. per aetat." M. umbrosum (Walt.) Blal e (Pennell).

Monotropsis odorata Ell. i. 479. "Monotropsis Schweinitz. Hab. juxta Salem, No. Car. Flor. Feb. Mar. Mr. Schweinitz."

Ophiorrhiza lanceolata Ell. i. 238. A specimen labelled "Ophiorrhiza Mitreola L. in humidis in insulis mar. praec. Chaplinn Fregi. Flor. Aug. Sept." has been indicated by someone (perhaps Ravenel) as the *O. lanceolata* of the Sketch. The leaves of this specimen, however, are not long-lanceolate. The description applies better to an unlabelled specimen mounted beside it, in which the rameal leaves are long-lanceolate. The two cauline ones left, however, are elliptic rather than lanceolate. CYNOCTONUM MITREOLA (L.) Britton (B. & B.)

Orchis bidentata Ell. ii. 488. A specimen (flowering raceme and three reduced upper leaves) without label, but agreeing with the description, probably represents this species. "Perularia flava (L.) Farwell" (B. & B.), i. e. HABENARIA FLAVA (L.) Spreng.

OXALIS RECURVA Ell. i. 526. "Flor. Apr. Hab. in cultis et pascuis circa Charleston." The specimen has suffered much; no flowers and only a few leaves are left.

PANICUM AMARUM Ell. i. 121. Type not found. Ravenel has annotated as "Panicum amarum Ell. Sk." a specimen labelled by Elliott with an unpublished name and the data "Hab. in spissis maritimis Flor. Sept." This specimen is *P. virgatum* and was so determined by Scribner & Merrill.

PANICUM ANGUSTIFOLIUM Ell. i. 139. "Hab. in aridis. Flor. Ma ?"

Panicum cenchroides Ell. i. 111. "Hab. Jekyl, Georg. Dr. Baldwin." No. 475 on separate slip. CENCHRUS MYOSUROIDES HBK. (Scribner & Merrill; Hitchcock).

PANICUM CILIATUM Ell. i. 186. "Flor. per . . . in umbrosis aridis. 480."

Panicum corrugatum Ell. i. 113. "Hab. Georgia. Dr. Baldwin." A separate slip, probably Baldwin's, reads: "511. Is this a var. of glaucum?" SETARIA CORRUGATA (Ell.) Schultes.

Panicum crusgalli var. *muticum* Ell. i. 114. "var. mutica Carol." ECHINOCHLOA CRUSGALLI var. MITIS (Pursh) Peterm. (Hitchcock).

PANICUM ENSIFOLIUM Baldw. ex Ell. i. 126. "Hab. in humidis. Georg. Dr. Baldwin."

Panicum gibbum Ell. i. 116. "Flor. Aug. Sept. Car. Georg. in locis udis." SACCIOLEPIS STRIATA (L.) Nash (Hitchcock).

PANICUM GYMNOCARPON Ell. i. 117. "Hab. in solis subhumidis juxta Savannah. Flor. Aug. Sept. Dr. Baldwin."

PANICUM HIANS Ell. i. 118. "Hab. in pinetis humidis. Flor. Aug. Oct."

PANICUM LANUGINOSUM Ell. "Hab. Georg. Dr. Baldwin". no. 483 on separate slip.

Panicum multiflorum Ell. i. 122. "Hab. in umbrosis. Flor. Mai. June". P. POLYANTHES Schult., based on *P. multiflorum* Ell. not Poir.

Panicum ovale Ell. i. 123. "Hab. St. Mary's, Georg. Dr. Baldwin." No. 290.

Panicum pauciflorum Ell. i. 120. "Hab. in humidis umbrosisque. Flor. Apr. Mai." On separate slip no. 490. P. oligosanthes Schult., based on *P. pauciflorum* Ell. not R. Br.

Panicum scabriusculum Ell. i. 121. "Hab. Georg. Dr. Baldwin."

Panicum sphaerocarpon Ell. i. 125. "Hab. Georg. Dr. Baldwin." On separate slip no. 498.

Panicum strigosum Muhl. ex Ell. i. 126. "Hab. in humidis, Car. et Georg. Flor. Ma. Jun."

Panicum villosum Ell. i. 124. "Hab. in umbrosis. Flor. Ap. Ma." P. consanguineum Kunth, based on *P. villosum* Ell. not Lam.

Panicum viscidum Ell. "Hab. in humidis. Flor. per aetat." P. scoparium Lam. (Scribner & Merrill; Hitchcock).

Panicum Walteri Ell. i. 115. "Hab. in humidis circa stagnum 6½ a Sav. versus Ogeechee. Flor. Mai. 478" P. hemitomon Schult., based on *P. Walteri* Muhl. (which is the same as *P. Walteri* Ell.), not Pursh.

Paspalum dasyphyllum Ell. i. 105. "Hab. in cultis. Flor. Aug. Oct." P. supinum Bosc ex Poir. (Chase).

Paspalum vaginatum Ell. i. 109. "Hab. Georg. Dr. Baldwin." On a separate slip "membranaceum 477". P. dissectum L. (Chase).

Pentstemon dissectum Ell. ii. 129. "Hab. Louisville, Georgia. Mr. Jackson."

Phlox cordata Ell. i. 244. A specimen without label, determined as P. maculata L. by B. & B. and by Wherry and in a cover marked with a manuscript name, very likely represents this species. It agrees with the description.

Poa ambigua Ell. i. 165. "Hab. in mont. Carolinae. Flor. autumn. Dr. Macbride." Triodia Langloisii (Nash) Bush. *P. ambigua* Ell., not *T. ambigua* R. Br. (Hitchcock).

Poa conferta Ell. i. 158. "Hab. juxta Columbiam. Mr. Herbemont. 518". Elliott's name is, however, a substitute for *P. glomerata* Walt., given under the mistaken impression that there was a *P. glomerata* L. Eragrostis glomerata (Walt.) L. H. Dewey (Scribner & Merrill; Hitchcock).

Poa nitida Ell. i. 162. "Hab. in cultis, Paris Island. Flor. per aetatem." Eragrostis Elliottii S. Wats., based on *P. nitida* Ell. not Lam.

Poa tenuis Ell. i. 156. "Hab. Greenville Co., So. Car. Flor. aut. Mr. Moulins." Eragrostis capillaris (L.) Nees (Scribner & Merrill; Hitchcock).

Polygala ramosa Ell. ii. 186. A specimen without label and in a cover marked only "Polygala", but agreeing with the description, has been designated as type by B. & B.

Polygonum fimbriatum Ell. i. 583. "Hab. in aridis inter amnes Flint et Chatahoochie, Geor. Flor. Aug. Sept." THYSANELLA FIMBRIATA (Ell.) A. Gray.

POLYGONUM PUNCTATUM Ell. i. 455. There is much confusion and probable transposition of labels among the specimens here. That labelled "Polygonum barbatum Muhl. punctatum mihi" is *P. hydropiperoides* Michx. and, of course, does not agree with Elliott's description of *P. punctatum.* The specimen labelled "Polygonum Hydropiperoides—Mite Persoon" (the latter Elliott's name for *P. hydropiperoides* Michx.) is *P. setaceum* Baldw. The only specimen of *P. punctatum* as usually interpreted is labelled "P. var. Hydropiper".

Under these circumstances it seems best to be guided by Elliott's description and synonymy, to treat *P. punctatum* as a substitute name for *P. Hydropiper* sensu Michx. not L. and to continue to apply it in the now current sense, as synonymous with (and earlier than) *P. acre* HBK.

POLYGONUM SETACEUM Baldw. ex Ell. As above noted, there is no specimen so labelled. Here also it seems best to be guided by Elliott's description and the fact that there is a specimen of *P. setaceum* which he had seen, and continue to apply the name in its current sense.

PRUNUS UMBELLATA Ell. i. 541. A specimen labelled "Prunus Hab. in aridis umbrosis. Flor. Mart." agrees with the description and may be taken as type. It is in a cover marked "Prunus pennsylvanica ?"

Psoralea eglandulosa Ell. ii. 198. A specimen with one slip reading "Ps. eglandulosa" and another "Milledgeville. Dr. Boykin", in a cover marked "Psoralea eglandulosa". *P. pedunculata* (Mill.) Vail (B. & B.); P. PSORALIOIDES (Walt.) Cory var. EGLANDULOSA (Ell.) F. E. Freeman in RHODORA xxxix. 426 (1937).

Psoralea multijuga Ell. ii. 198. "Hab. Abbeville, So. Car. Mr. Gourdine." The label gives a manuscript name, but the specimen agrees with the description and has been designated as type by B. & B. It is accompanied by a note by Miss Vail stating that it was examined by Britton and Small in 1894 and determined as *Astragalus glaber* Michx. This determination, though adhered to by Small in both editions of his Flora and in his Manual, is disputed by Boynton in another note on the folder. He, however, does not say what the specimen is. In habit and foliage, it does resemble *A. glaber*, but the inflorescence appears quite different. I did not recognize it; it should have further investigation.

Ranunculus oblongifolius Ell. ii. 58. "Hab. in humidis. Flor. Mai." no. 588. R. PUSILLUS Pursh (Fernald).

Ranunculus palmatus Ell. ii. 61. "Hab. St. John's, Santee. Flor. Mai. Dr. Macbride." no. 590. R. HISPIDUS Michx. (with appressed pubescence) (Fernald).

Ranunculus trachysperma Ell. ii. 65. "Hab. St. John's, Santee. Flor. Maio. Dr. Macbride." no. 591. R. PARVIFLORUS L. (B. & B.)

Rhexia angustifolia Ell. i. 438. "Hab. in udis juxta Savannah. Flor. Jun. Jul." The specimen is labelled R. LANCEOLATA Walt.; Elliott's name appears to be no more than an illegitimate substitute for Walter's.

RHYNCHOSPORA CADUCA Ell. i. 62. "Hab. in udis juxta Charleston. Flor. per aetatem."

RHYNCHOSPORA PLUMOSA Ell. i. 58. "Hab. in pratis aridis, Geor. Car. Flor. Mai. Jul."

SABBATIA BRACHIATA Ell. i. 284. "Hab. in Car. et Geor. superiore. Mr. Herbemont. Dr. Boykin."

Sabbatia corymbosa Baldw. ex Ell. i. 283. "Hab. in pinetis humidis. Flor. Jul. Aug." On separate slip no. 332. S. DIFFORMIS (L.) Druce.

SABBATIA GENTIANOIDES Ell. i. 286. "Hab. in humidis, Bull. Co., Georg. Flor. Aug. Mr. Abbot."

Salsola linearis Ell. i. 332. "Flor. July–Sept. in scirpetis maritimis." SUAEDA LINEARIS (Ell.) Moq.

Salvia Claytoni Ell. i. 32. A specimen labelled "Salvia Verbenaca [the epithet later than the rest of the label] hab. pascuis aridis, Beaufort" probably represents this, though the leaves are scarcely cordate. S. VERBENACA L. (B. & B.); Elliott himself doubted if his plant was distinct from it.

× SARRACENIA CATESBAEI Ell. ii. 11. "Hab. Chesterfield Co., So. Car. Dr. Macbride" and at top of label "Catesby 69 b". *S. flava* × *purpurea* (J. M. MacFarlane).

Scirpus ciliatifolius Ell. "Hab. in humidis. Flor. Sept. Oct." BULBOSTYLIS CILIATIFOLIUS (Ell.) Fernald.

Scirpus coarctatus Ell. i. 83. "Flor. aut. in aridis Beaufort." BULBOSTYLIS COARCTATUS (Ell.) Fernald.

SCIRPUS DIVARICATUS Ell. i. 88. "In humidis pinetis. Flor. Jun." No. 272.

Scirpus equisetoides Ell. i. 79. "Hab. St. Stephen's, So. Car. et juxta Fayetteville, No. Car. Flor. Apr. Mai. Mr. Schweinitz." ELEOCHARIS EQUISETOIDES (Ell.) Torr.

Scirpus schoenoides Ell. i. 89. "Hab. Georgia. Dr. Baldwin." No. 408. RHYNCHOSPORA SCHOENOIDES (Ell.) Britton.

Scirpus simplex Ell. i. 76. "Hab. Ogeechee in udis". On separate slip no. 475. ELEOCHARIS TUBERCULOSA (Michx.) R. & S. (Svenson).

Scirpus stenophyllus Ell. i. 83. "Flor. per aet. in aridis." BULBOSTYLIS STENOPHYLLUS (Ell.) Fern.

Scirpus sulcatus Ell. i. 86. "Hab. in humidis. Flor. Sept." Fimbristylis diphylla (Retz.) Vahl. *F. laxa* Vahl (B. & B.)

Scleria gracilis Ell. ii. 557. "Hab. St. Mary's, Geor. Dr. Baldwin." The label does not bear the specific epithet, but habitat-data and description agree and it is designated as type by B. & B.

Scleria hirtella var. *strigosa* Ell. ii. 560. "Hab. Florida. Flor. Maio. Dr. Baldwin." Also another label, presumably Baldwin's, reading: "10. Scleria Is this one described by Mich.?" S. ciliata Michx. (B. & B.)

Sesuvium pentandrum Ell. "Hab. in salis juxta Charleston. Flor. per aetat." A second cover, marked "Sesuvium pentandrum", but without label, contains better material than that accompanying the label. S. maritimum (Walt.) BSP.

Sida gracilis Ell. ii. 159. "In aridis juxta Beaufort. Flor. Sept." The stem is minutely puberulent with branched hairs, not glabrous, as described. Sida Elliottii T. & G., based on *S. gracilis* Ell. not Rich.

Silene fimbriata Baldw. ex Ell. i. 515. The type has no Elliott label, but one, probably of Baldwin, reading: "Silene fimbriata. Crawford Co." S. Baldwynii Nutt. (B. & B.)

Sisymbrium Walteri Ell. ii. 146. "Sisymbrium tanacetifolium Walt. Hab. in humidis. Flor. Maio." Rorippa Walteri (Ell.) Mohr.

Sium tricuspidatum Ell. i. 354. "Hab. in humidis. Flor. per aetat." The specimen is almost wholly consumed by insects; only stems and fragments of leaves remain. Oxypolis rigidior (L.) Raf. (B. & B.)

Solanum nigrum L. var. *virginicum* Ell. i. 281. "In cult. et pascuis ubique." The leaves in the specimen accompanying Elliott's label are not repand; it has been determined by B. & B. as *S. nigrum.* Elliott's name is not based on *S. virginianum* L., which is treated as a separate species on the same page of the Sketch.

Solidago angustifolia Ell. ii. 388. No type was found at Charleston. There is, however, a fragment in the Gray Herbarium with a Torrey & Gray label reading, "S. angustifolia Ell. ! ramus ex herb. ips." This is very likely a duplicate given to Torrey when he borrowed Elliott's material and shared by him with Gray. S. petiolata Mill. (Fernald).

Tillandsia Bartramii Ell. i. 379. "Hab. Mortar Swamp, Liberty Co., Georg. Mr. Le Conte." T. tenuifolia L. (L. B. Smith).

Trillium Catesbaei Ell. i. 429. "Hab. Car. et Geor. sup. Mesrs. Brown & Perry"

Trillium nervosum Ell. i. 429. "Hab. Car. sup. Mr. Greene."

Vicia acutifolia Ell. ii. 225. A specimen labelled "Vicia Flor. Apr. Scriven Co. Georgia" and named *V. acutifolia* by B. & B. is probably to be taken as type.

Villarsia cordata Ell. i. 230. "Hab. juxta Granby in rivulo dicto Savannah Hunt. Flor. Aug. Sept." Nymphoides cordatum (Ell.) Fern.

Viola esculenta Ell. ex Brainerd, Bull. Torr. Bot. Club xxxvii. 588 (1910). Label reads: "Viola esculenta mihi. Heterophylla Muhl. Fl. Apr. in udis Ogeechee etiamsi [words illegible] Pennsyl."

Viola tripartita Ell. i. 302. "Hab. Athens Georg. Mr. Green."

THE HYBRID OAK, × QUERCUS RUDKINI, AT ARLINGTON, VIRGINIA

H. A. Allard

(Plate 709)

Fifteen or twenty years ago the writer found a small oak seedling at Lyon Park, Arlington Co., Virginia, which appeared to combine some of the characteristics of two common species of oak growing in the immediate locality, namely, the Willow Oak, *Quercus phellos* L., and the Black Jack Oak, *Q. marilandica* Muench. Other members of the Red Oak group also grew here, including the Pin Oak, *Quercus palustris* Muench., the Scarlet Oak, *Q. coccinea* Muench., the Black Oak, *Q. velutina* Lam., the Red Oak, *Q. borealis* Michx. var. *maxima* (Marsh.) Ashe, and the Spanish Oak, *Q. falcata* Michx.

The shape, texture, pubescence, greenness and luster of the leaf, bud characters, and acorn characters suggested hybridity between *Q. phellos* and *Q. marilandica,* rather than between any other species of this Red Oak assemblage.

An interest in the flora of our area, and more especially in some of the supposedly hybrid oaks of the District area, led the writer to publish an account of some of these aberrant forms and to report on a study of the progeny of Saul's Oak, *Quercus saulii* Schneid., growing at Arlington, Va.

In this paper[1] drawings were presented illustrating various leaf forms produced by the supposed hybrid oak, *Q. phellos* × *mari-*

[1] "A Progeny Study of the So-Called Oak Species *Quercus saulii*, With Notes on Other Probable Hybrids Found in or Near the District of Columbia," by H. A. Allard. Bull. Torr. Bot. Club **59**: 207–277, 1932.

landica above referred to. At that time, the actual hybrid nature of this oak and the parents involved was a matter of pure conjecture. After an interim of nearly ten years, further corroborative evidence appears at hand establishing with even greater certainty the hybrid origin of this oak involving *phellos* and *marilandica* parentage.

Recently Dr. W. C. Coker of the University of North Carolina, visited the writer and, after an examination of this oak material, tentatively pronounced it to be similar to a hybrid oak discovered some years ago at Chapel Hill, North Carolina.

This oak was referred to in a footnote in the excellent work by Coker and Totten[1] (p. 157). It was stated in this footnote that the tree was regarded as a hybrid between *Q. phellos* and *Q. marilandica.* Many acorns were then planted in their propagating gardens from this aberrant tree, and a progeny of about 75 trees was secured. These immediate descendants showed great variation in all morphological characters and also in growth habit. The leaves of some of these trees almost duplicated the *phellos* parent, while others closely duplicated the *marilandica* parent, substantiating their previous surmise as to the species involved in its hybridity. Other trees in this progeny showed various intermediates in form of leaf. A number of the trees were poor and stunted due probably to some semilethal combination of factors, while others were vigorous and striking in appearance due to more favorable combinations.

This study of the actual descendants of the oak tree found at Chapel Hill, and comparisons of this material with that at Arlington, Virginia, show that the similarity of their characteristics is so close that there seems to be no other logical alternative than to pronounce the latter definitely a hybrid of *Q. phellos* and *Q. marilandica.*

The opinion is held by some specialists that most of the so-called hybrids of the District area appear to be merely aberrant forms of our well recognized species, the only exception, perhaps, being *Quercus saulii.*

In view of the more recent evidence of its hybrid nature, the Arlington oak cannot well be regarded as a simple variant of

[1] "Trees of the Southeastern States," by William Chambers Coker and Henry Roland Totten, University of North Carolina Press, Chapel Hill, N. C., 2nd Ed., 1937.

either *Q. phellos* or *Q. marilandica.* If this view is held unconditionally, then its various intermediate characteristics and its progeny make it a variant of both, and *Q. phellos* and *Q. marilandica* then become extremes of one species-assemblage, a concept which most botanists would not subscribe to.

This hybrid oak appears to have been first described by N. L. Britton[1] in 1882 and named by him *Quercus Rudkini.* Later C. S. Sargent[2] illustrated a supposed cross of *Q. phellos* and *Q. marilandica.*

It may be stated that the illustrations both of Britton and of Sargent agree closely with the Arlington and the Chapel Hill material.

There is also some question as to whether it is entirely correct to regard the Bartram Oak, *Quercus heterophylla* Michx. f., as a mere variant of *Q. phellos* or of some other member of the Red Oak group.

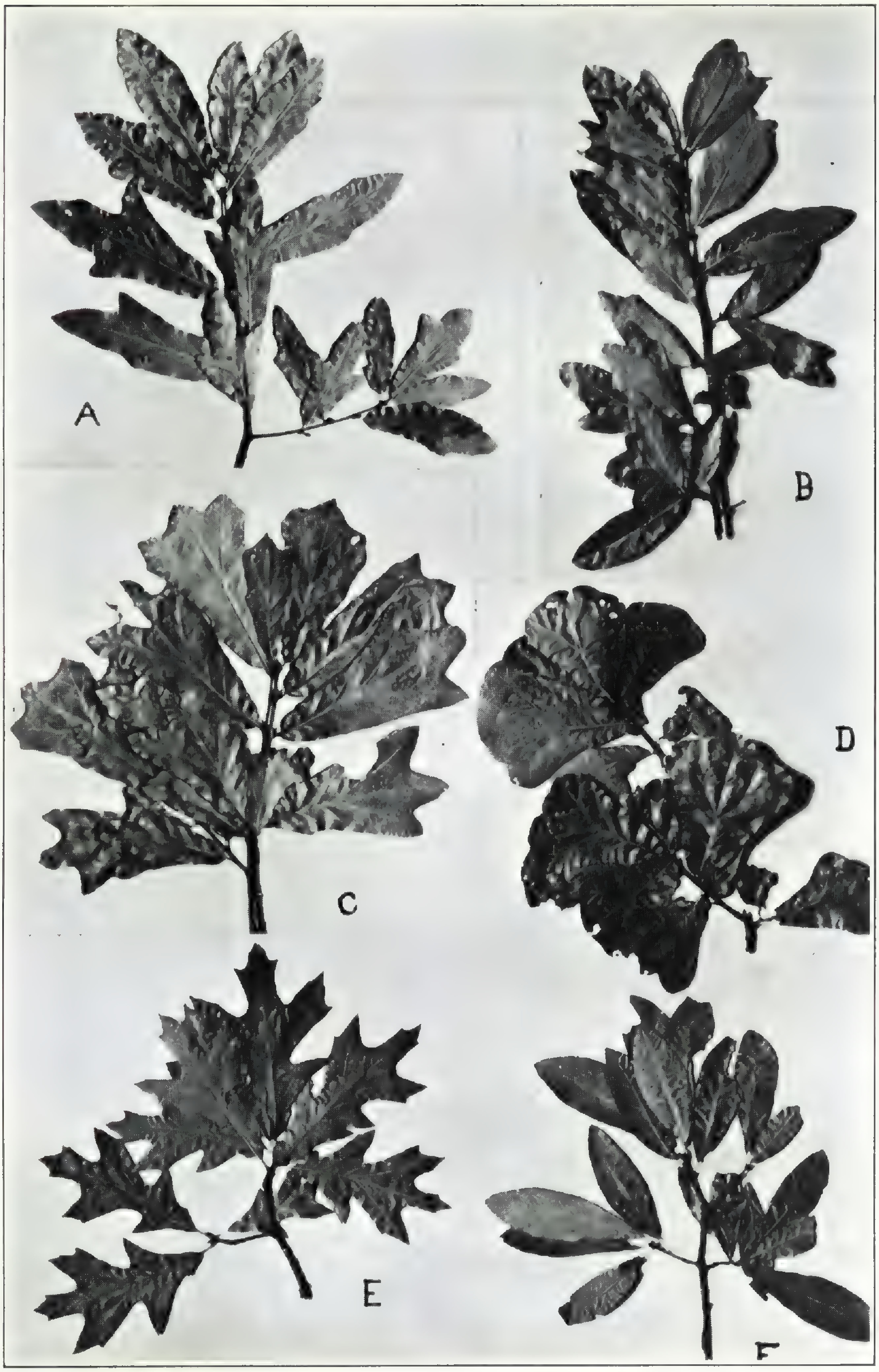
It should be remembered in this connection that D. T. MacDougal[3] in 1907 obtained 55 seedlings of a Bartram form of oak, which gave extremes of leaf form extending from *Q. phellos* to *Q. maxima.* From this MacDougal reasonably concluded that Bartram's oak is an indubitable hybrid which has naturally arisen between *Q. phellos* and *Q. maxima.* It is doubtful if any stretch of the imagination will, in this instance, lead one to conclude that this assortment shows merely the variations to be expected in either *Q. phellos* or in *Q. maxima.* Why, furthermore, should we regard MacDougal's experimental work as invalid evidence in this matter?

If our oaks hybridize, as undoubtedly they sometimes do, there is perhaps a very remote probability that the first cross or any particular derivative of such cross will survive. While it is established experimentally that in the case of *Quercus heterophylla* MacDougal's Bartram form was of *phellos* × *maxima* parentage, there is still some question as to its actual identity with the original material which the younger Michaux described and named in 1810. However, if the Michaux type is identical in origin and character with MacDougal's tree and the District

[1] "On a Hybrid Oak Near Keyport, N. J.", Bull. Torr. Bot. Club **9:** 13–15. pl. 10–12. 1882.

[2] "The Silva of North America", by C. S. Sargent, **8:** pl. 437. 1895.

[3] "Hybridization of Wild Plants", by D. T. MacDougal, Bot. Gaz. **43:** 45–58, 1907.



A. Twig of Quercus Rudkini Britton (*Q. phellos* L. × *Q. marilandica* Muench.) growing at Arlington, Va., on the writer's grounds. *B*. Twig of tree of Q. Rudkini at Chapel Hill, N. C., F_1 seedlings of which are shown as *C*, *D*, *E*, and *F*. *C* and *D* show plainly the leaf-form character of *marilandica*, *D* very closely resembling this species. *E* retains certain *marilandica* characters. *F* is a form with laurel-like leaves, showing more of the character of *phellos* by its lack of lobing. Orig. photo. by *H. A. Allard*, about 1/6 natural size. Chapel Hill material represented by *B*, *C*, *D*, *E*, and *F* was kindly furnished by Dr. W. C. Coker of the University of North Carolina, Chapel Hill, N. C.

material, then *Q. heterophylla* in our area is a valid and proven hybrid quite as much as *Q. saulii*, or the Arlington, Va., and the Chapel Hill, N. C., material of *Q. phellos* × *marilandica*.

The writer fully appreciates the difficulties involved in the identification of oak material where hybrid forms are concerned. It may be stated that the Arlington *Q. phellos* × *marilandica* material was identified as *Q. heterophylla* by some workers in the United States National Herbarium. This was really a very natural procedure for anyone, owing to the confusion of different material brought together under this name, partly because the original type of Michaux was not conveniently at hand.

There is no reason why *Q. velutina*, *Q. coccinea*, *Q. falcata*, and *Q. palustris* should not also hybridize occasionally with *Q. phellos*, and some of the derivatives of these may well very closely resemble material of the *Q. phellos* × *maxima* assemblage. This fact may be responsible in part for no little confusion in determinations of such hybrid material.

The *Q. phellos* × *marilandica* hybrid found at Arlington may well occur elsewhere in our area. For this reason an abundance of material, both foliage and acorns, of the Arlington oak originally described and illustrated (see footnote 1), has been collected under the writer's numbers 9707, 9729 and 9802.

Such specimens as have been brought together under the designation *Q. heterophylla* in the collections of the United States National Herbarium, include a wide assortment of material. Most of this, if of hybrid origin, appears in some instances to involve other crosses than *Q. phellos* × *marilandica*, although this should not be so, for Bartram oak material which involves the cross *Q. phellos* × *maxima*.

One sheet, however, No. 1437, collected by T. H. Kearney in 1898 at Ocean View, Norfolk Co., Va., approaches closely the Arlington material of *Q. phellos* × *marilandica*.

Material of the Arlington hybrid tree has been deposited in the Herbarium of the National Arboretum (9707 & 9729), in the Herbarium of the University of North Carolina (9802), and in the United States National Herbarium (9707, 9729 & 9802) from which duplicates will be widely distributed. All material is from the original tree first reported in 1932 (footnote 1).

It may be stated that a new flora is now proposed for the

Washington area. This is designed to cover a greatly enlarged area as compared with the original District Flora. Such a work when completed will represent the efforts of many botanists, and is planned to serve as an authoritative flora for many years to come for botanical students interested in this area. For this reason, a proper evaluation of the hybrid or non-hybrid status of some of our variant oak material is particularly urgent at the present time.

Washington, D. C.

HIBISCUS MOSCHEUTOS AND H. PALUSTRIS

M. L. Fernald

For three and a half centuries three variations of the native *Hibiscus* of the Atlantic slope of the United States, with lance-ovate to subrotund leaves green and glabrous or merely scabridulous above and soft-pubescent beneath, have been cultivated in Europe. These include (1) the more northern plant with the principal cauline leaves, below the inflorescence, broadly ovate to suborbicular in outline and often angulate-lobed (suggesting maple leaves), averaging three fourths as broad as long but sometimes even broader than long, with most or all peduncles free, except sometimes at base, from the subtending petioles, the petals pink to purple, with deeper-colored base, the branches of the style pilose or hirtellous, the capsule subglobose or depressed; (2) a plant quite similar to no. 1 but with creamy-white corolla with red center; and (3) a very different plant, with the principal leaves narrowly ovate to ovate-lanceolate and unlobed or only obsoletely so, or the lower tricuspidate, long-acuminate, averaging only one-third as wide as long, some of the peduncles fused to the lower halves of the subtending petioles, the corolla white or whitish with crimson or red eye, the long styles with glabrous branches, the unexpanded capsules conic-ovoid.

So generally were no. 1 (with relatively broad and short leaves, free peduncles and pink corollas) and no. 3 (with narrower and proportionately longer leaves, often fused peduncles and petioles, and white corollas with red centers) in European gardens and so frequently were they illustrated in full color and so generally described that it was surprising (to put it mildly) to have a

white-flowered plant of cultivation put forward as a brand new species in 1903, as if nothing of the sort had previously been known. At that time, having received from Pitcher & Manda, horticulturists, a plant they were selling as "Crimson-eyed Hibiscus" or *Hibiscus Moscheutos albus,* Britton wrote: "Hibiscus Moscheutos has the pink flowers as above noted, a nearly globular, blunt pod, and its calyx-lobes are triangular-ovate, about as broad as long. The crimson-eyed one has an ovoid pod with a long point, and its calyx-segments are triangular-lanceolate, nearly twice as long as broad. I propose that it shall have the botanical name HIBISCUS OCULIROSEUS."—Britton in Journ. N. Y. Bot. Gard. iv. 219, 220, pl. xviii (1903). In his plate representing the rose-flowered plant (pl. xvii), which he mistakenly identified as *H. Moscheutos* L., Britton showed a fruiting summit, with globose-ovoid capsules terminating naked peduncles; in his plate of his supposedly new *H. oculiroseus* some of the peduncles fused to the petioles and the capsule conic-ovoid. Although the accompanying quotation seems to indicate that the original wild plants, from which *H. oculiroseus* was developed, came from stations on the Atlantic side of southern New Jersey, it is presumable that some mixture had occurred, since for centuries *H. oculiroseus* had been in cultivation. At least, the hundreds of sheets representing the group in the herbaria of the New York Botanical Garden and of the Academy of Natural Sciences of Philadelphia, kindly loaned me for comparison, show no New Jersey specimens like the long-fruited plant illustrated by Britton as his new *H. oculiroseus* nor like the flowering specimen from Pitcher & Manda marked clearly by Dr. Britton as TYPE of *H. oculiroseus.* The latter has the style-branches glabrous. The white-flowered, like the roseate-flowered, material from New Jersey, New York and New England all has pubescent style-branches and characteristic foliage and lower peduncles identifying it with form no. 2 of my preliminary grouping, one of the plants long cultivated in Europe and beautifully illustrated in full color as *H. Moscheutos* (from the gardens of A. B. Lambert) by Sweet, British Flower Garden, iii. t. 286 (1829), Sweet not only showing the white corolla with red center and the pubescent style-branches, but explicitly describing the "lower leaves broadest, and more or less three-

lobed, the side lobes short and acute. . . *Peduncles* . . the lower ones longest and axillary. . . . *Style*. . . smooth below, but hairy above the stamens." The purple-flowered plant, so general from Massachusetts to New Jersey, Delaware, eastern Maryland, and less so to eastern Virginia, with similar leaves and peduncles and with pubescent style-branches (*H. palustris* L.) was to Sweet merely *H. Moscheutos*, β. *purpurascens* Sweet, l. c. (1829). Nearly 60 years later this albino of *H. palustris* was again described and illustrated in natural color, this time as *H. palustris* (as *paluster*), var. *albi-*

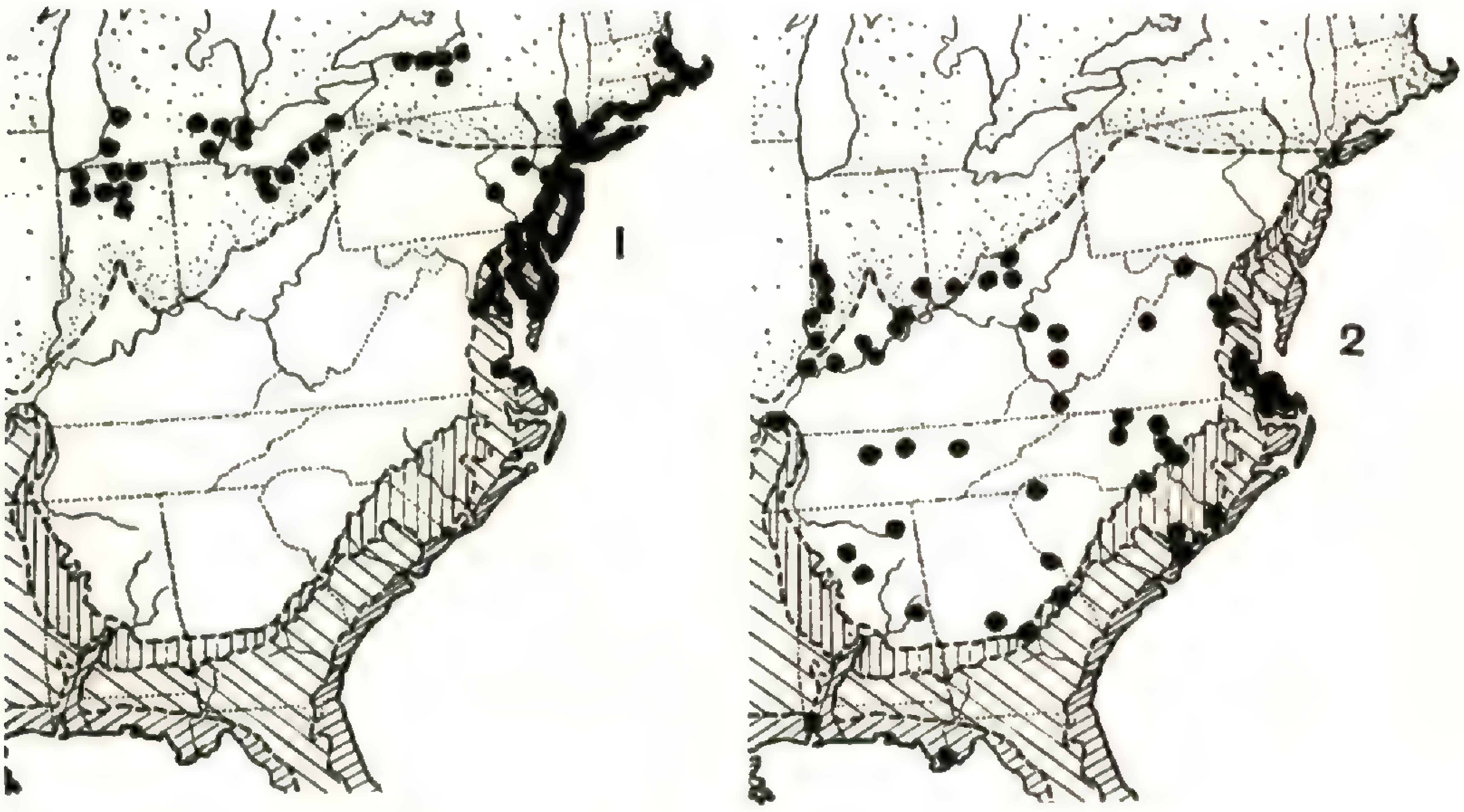


FIG. 1, Range of HIBISCUS PALUSTRIS; FIG. 2, of H. MOSCHEUTOS.

florus Leichtlin ex Kolb in Neubert's Deutsch. Gart. Mag. xl. 193, t. 10 (1887).

Unfortunately, color alone became the one test of the supposedly new *Hibiscus oculiroseus* and on the sheet with the plate of that plant at New York there was mounted a memorandum by Dr. Britton, that *H. oculiroseus* fills a marsh on Staten Island "all with crimson eye, but petals either white or pink on adjacent plants but not on same plant"; and on the same sheet, marked as *H. oculiroseus*, there was mounted a beautiful photograph, taken by Arthur Hollick on Staten Island, of the white-flowered *H. palustris* (with broad 3-lobed maple-like leaves). Quite similar material, with broad maple-like leaves and pubescent style-branches, was distributed as *H. oculiroseus*

from the New York Botanical Garden. Thus, confusion at the source promptly discredited *H. oculiroseus* and completely obscured morphological and geographic differences between the series which abounds from Massachusetts to New Jersey and on to eastern Virginia and inland across New York and southern Ontario and westward along the Great Lakes, and a more southern plant, found from northern Florida northward to Chesapeake Bay and Anacostia and Potomac Rivers, Virginia, and to West Virginia, Ohio and Indiana. The former is *H. palustris* L., the latter, not definitely known in Delaware, eastern Pennsylvania, New Jersey, New York and New England, is *H. Moscheutos* L. After making thousands of measurements of the many hundreds of specimens in the four collections, those of the Gray Herbarium, the New England Botanical Club, the New York Botanical Garden and the Academy of Natural Sciences of Philadelphia (including a tremendous local representation) I find that the northeastern and the usually more southern plants are separated on the following lines.

H. PALUSTRIS: median cauline leaves (below inflorescence) usually broadly ovate to roundish and commonly 3-lobed, 7–18 (av. 12) cm. long and 4.5–11.5 (av. 8) cm. broad, sometimes as broad as or broader than long; peduncles all or nearly all leafless or united close to base with subtending petiole (only exceptionally, about 3 %, leafy-bracted), the joint or node 0.5–2 (av. 1) cm. below the calyx; petals pink, purple or white, usually with red or crimson base; stamineal column 0.8–2 (av. 1.4) cm. in diameter; style (from summit of ovary) 3–6 (av. 4.4) cm. long, the exserted half (from summit of stamineal tube to tips of branches) 1–3 (av. 1.8) cm. long, the branches pubescent (usually heavily so); capsule subglobose, with depressed or broadly rounded summit, blunt or abruptly short-tipped, 2–2.5 cm. high. —Massachusetts to eastern Virginia, inland from western New York to southern Ontario, southern Michigan and northern Indiana (MAP 1).

H. MOSCHEUTOS (*H. oculiroseus* as to TYPE): median cauline leaves narrowly ovate to lanceolate, 8–22 (av. 13) cm. long and 3–9 (av. 5.3) cm. broad, *i. e.*, averaging 2.7 cm. narrower than in *H. palustris*, unlobed or the middle and lower tricuspidate; one to several peduncles usually fused for one third to three fourths their length to subtending petiole, the node 1–5 (av. 2.25) cm. below the calyx; petals white or creamy with purple or red base; stamineal column 1.2–2.5 (av. 2) cm. in diameter; style 4–8 (av. 6) cm. long, its exserted half 1–3.5 (av. 2.6) cm. long, the

branches glabrous (or very rarely remotely hispid); capsule conic-ovoid, tapering to erect beak, 2.5–3 cm. long.—Northern Florida and Alabama, northward to Chesapeake Bay and tributaries, Maryland and Virginia, West Virginia, southern Ohio and southern Indiana (MAP 2).

Linnaeus, knowing two of these American plants, as his *Hibiscus Moscheutos* and his *H. palustris*, confused with them quite different elements from Africa and elsewhere; but when his treatments of 1753 are analyzed and the extraneous (African and other Old World) matter excluded we have left a core of data under each which shows that he had primarily in mind (from Virginia), the two elements which had been collected there and described by Clayton.

The two temperate eastern North American species of Linnaeus (1753) were as follows:

1. HIBISCUS foliis ovatis acuminatis serratis, caule simplicissimo, petiolis floriferis. *Hort. ups.* 205. *Moscheutos.*
   Hibiscus foliis ovatis crenatis: angulis lateralibus obsoletis. *Hort. cliff.* 349. *Gron. virg.* 79. *Roy. lugd.* 358.
   Alcea rosea, peregrina, forte Rosa moscheutos plinii. *Corn. canad.* 144. t. 145. *Moris. hist.* 2. *p.* 532. *s.* 5. *t.* 19. *f.* 6. ♃
   Habitat in Canada, Virginia.
2. HIBISCUS caule herbaceo simplicissimo, foliis ovatis subtrilobis subtus tomentosis, floribus axillaribus. *palustris.*
   Althaea palustris *Bauh. pin.* 316. (*ex horto C. B. Burserus*).
   Althaea hortensis s. peregrina. *Dod. pempt.* 655 [644]
   Habitat in Virginia. *Gronov.* Canada. *Kalm.* ♃
   Habitus *H. Moscheutos.* Caules *sesquipedales, non ramosi, annui.* Folia *lato-ovata, obtuse serrata, trinervia, acuminata, subtus tomentosa.* Pedunculi *ex axillis foliorum superiorum solitarii, petiolo longiores, uniflori, non e petiolo enati, geniculati.* Flos *maximus.*

The reference to Cornut's misnamed Canadensium Plantarum (1635) leads to a plant of Africa, thought by Cornut to be Pliny's *Althaea* (changed by Linneaus to *Alcea*) *rosea*, a bushy-branched plant shown with strongly depressed and long-beaked fruiting calices such as never occur in our American species. The reference to Morison leads to the same African plant, Morison copying his illustration directly from Cornut, while the Royen reference gives no further light. Taking into account

chiefly the references to plants actually or presumably studied by Linnaeus from Virginia we do better. According to the late Dr. B. Daydon Jackson, there was no material of *Hibiscus Moscheutos* in the Linnean Herbarium. The Hortus Cliffortianus plants "Hibiscus foliis ovatis crenatis," etc. with the synonyms *Ketmia africana* and *Althea rosea* were based in part on a plant which "*Crescit in* Africa", while a specimen labeled by Linnaeus "*Hibiscus Moscheutos*" in the Clifford Herbarium is *Kosteletzkya virginica* (L.) Presl, var. *altheaefolia* Chapm. Furthermore, the statement by Linnaeus that his *H. Moscheutos* grows in Canada was evidently derived from the misleading title of Cornut's work. We have left, then, the original account in Hortus Upsaliensis (1748), the account in Gronovius and the diagnosis in 1753. Cutting out the misleading references already discussed for an American plant, to Royen, Cornut, Morison and others, there are left the following very clear diagnosis and observation in Hortus Upsaliensis:

1. Hibiscus foliis ovatis acuminatis serratis, caule simplicissimo, petiolis floriferis.
   Hibiscus foliis ovatis crenatis: angulis lateralibus obsoletis. *Hort. Cliff.* 349. *Gron. virg.* 76. . . . .
   Ketmia americana, populi folio. *Tourn. inst.* 100.
   . . . .
   Habitat in Canada, Virginia.
   . . . .
   Obs. Caulis *quotannis perit, illeque simplicissimis est &* pedunculus *exit e petiolo, non vero e caule, quod indicat affinitatem cum* Turnera. Flos vere speciosus & pulcherrimus.

The Tournefort reference, misquoted by Linnaeus "*Ketmia americana, populi folio*", was originally Ketmia Africana, *Populi folio* and based directly on the African *Althea rosea* of Cornut; but turning to what Linnaeus himself had studied, besides the plant of the Upsala garden so vividly described, we come to the account by Gronovius. Here again, omitting the literary guesses, the kernel is in the original account by Clayton of the living plant: "Ketmia palustris frutescens, flore maximo candido, umbilico purpureo, foliis Aceris mollibus.—*Clayt. n. 122.*"

Reassembling the accounts of the actual material studied by Linnaeus and omitting all the erroneous synonyms, we get a simple-stemmed perennial, with ovate, acuminate leaves (Clay-

ton's "foliis Aceris" could have been based on the albino of *H. palustris*), the petioles and peduncles connate, the corolla white with purple center. The white corolla with purple center and the relatively unlobed acuminate leaf were two of the characters emphasized by Britton in describing his *H. oculiroseus.* The bearing of a leaf on the peduncle was not mentioned by him but his artist caught this character, one peduncle in his plate showing a leaf below the fruiting calyx, two each with a leaf borne high on a peduncle with the calyx gone. Just such plants were frequently illustrated and often described by early post-Linnean botanists of Europe as *H. Moscheutos.* Cavanilles, Willdenow, Persoon, DeCandolle, Sprengel, Don and others maintained *H. Moscheutos* and *H. palustris* as distinct on the Linnean characters, Cavanilles, Diss. 163, t. 65, fig. 1 (1785) showing the peduncles of *H. Moscheutos* leafy-bracted and describing the "Corolla magna luteo-albicans; petalis unguibus incarnatis"; Willdenow Sp. Pl. iii[1]. 806 (1800), concocting the German name for it "Blattstielblütiger Hibiscus"; Persoon, Syn. ii. 254 (1806) adding to the leaf-outline and the "petiolis floriferis", "Cor. albida, fundo purpureo"; and so on with many authors. Walter, familiar only with the southern species, described as *H. Moscheutos* a very large-flowered plant with leaves silky on both sides, presumably *H. lasiocarpos* Cav., and for true *H. Moscheutos* he misused the name *H. palustris,* "*petiolis floriferis;* floribus . . . albis fundo purpureo"; but the most beautiful demonstration of the early correct interpretation of *H. Moscheutos* was by Nees & Sinning in their Samml. Schönblühende Gewächse, 87, t. 37 (1831). Their description of *H. Moscheutos,* Der blattstielblüthige Hibiscus, was explicit: "Diese Pflanze ist dem, in dem zweiten Heft beschriebenen, H i b i s c u s p a l u s t r i s zwar sehr ähnlich, aber doch durch folgende Merkmale hinlänglich verschieden:

Die Blätter sind nur an dem untern Theil des Stengels dreispitzig (tricuspidata), an dem obern Theil eiförmig und in eine lange Spitze ausgedehnt.

Die Blüthenstiele entspringen an der Spitze des Stengels aus den Blattstielen, oder sind vielmehr mit diesen bis über die Mitte in eins verwachsen, und sind oberhalb der Mitte mit einem verdickten Absatz versehen; doch kommen auch besonders nach unten einzelne Blüthenstiele ganz aus den Winkeln der Blattstiele hervor.

Die Blüthen sind noch grösser, s c h ö n w e i s s m i t e i n e m p u r p u r r o t h e n F l e c k e n a m G r u n d e . . . "

Nothing could more perfectly display the full beauty of true *Hibiscus Moscheutos* than the great folio plate of Nees & Sinning, showing life-size and in perfect color the lance-ovate leaves, the several peduncles leafy-bracted near or above the middle and great white but red-eyed corollas 2 dm. broad, with style nearly 6 cm. long, its branches glabrous. Had Dr. Britton taken a moment and looked back merely to Nees & Sinning he would have seen a superb picture of *H. oculiroseus*, correctly called *H. Moscheutos* L.

With true southern *Hibiscus Moscheutos* having a white corolla with a red eye, with the northeastern *H. palustris* often having an albino of similar flower-color and with exceptional peduncles uniting at base with a petiole, it is natural that, by neglecting the different proportions of leaf-breadth to -length and the differences in style and capsule and the thickness of stamineal column, students should have thought of the two species as one. In 1806, in Curtis's Bot. Mag. xxiii. t. 882, Sims described and illustrated as *H. palustris* the plant of Linnaeus—with broad-ovate angulate-lobed leaves, pink petals, short style, and ebracteate peduncles; and he then suggested the possible identity of *H. palustris* and *H. Moscheutos.* This suggestion of Sims was not generally followed, but Torrey & Gray, familiar only with the plant of New Jersey and southeastern New York, where either pink or white corollas occur, considered this circumstance sufficiently conclusive and wrote: "Flowers . . . rose-color, or sometimes nearly white, crimson at the centre. . . From numerous observations, we are convinced that H. Moscheutos and H. palustris are not distinct species. It is not uncommon to find the peduncles and petioles both distinct and united on the same plant."—T. & G. Fl. N. Am. i. 237 (1838). From then on the two were generally merged as *H. Moscheutos*, although Hochreutiner argued in Ann. Conserv. Jard. Bot. Genève, iv. 140 (1900), that the suggestion of possible identity by Sims in 1806 constituted reduction of *H. Moscheutos* to *H. palustris;* and in Rhodora, xli. 112 (1939) I followed Hochreutiner in taking up *H. palustris* to include *H. Moscheutos;* and, without in the least understanding the plants, I published the combination *H. palustris*, forma *oculiroseus* (Britton) Fernald. At that time I had looked into the other characters

of the two quite as little as have most botanists; I should not now unite them.

I have repeatedly referred to the northern plant with broader-ovate leaves, mostly naked peduncles, roseate (or sometimes white) flowers, pubescent styles and subglobose capsules as true *H. palustris.* Linnaeus's account in 1753 has already been quoted (p. 270). His diagnosis and critical comments are clear. The only *Hibiscus* given by Gronovius, besides the one cited by Linnaeus under *H. Moscheutos*, was described "flore carneo speciosa, umbilico purpureo". The only other references given by Linnaeus are to Dodens (1583) and to Bauhin (1633). Dodens gave a remarkably good illustration of the plant so common from Massachusetts to New Jersey, etc., then cultivated in Belgium, with a special figure of the subglobose capsule, and his description said "flos . . . dilutè in rubro purpureus, aut ex albido purpurascens . . . : fructus . . . rotunda ferè ac globosa"; but the very condensed series of bibliographic references by Bauhin (including Theophrastus) is wholly inconclusive.

Until the ill-advised reduction of *H. palustris* to *H. Moscheutos*, the former was clearly understood. Just as they correctly defined *H. Moscheutos*, so Cavanilles, Willdenow, Persoon, DeCandolle, Sprengel and others up to Torrey & Gray understood *H. palustris* and many good plates, suggesting that of Sims, were published of it. In Bot. Reg. xvii. t. 1463 (1832) Lindley had a beautiful plate of it, and a clear description, including "Folia *ovata v. cordato-ovata, triloba* . . . Flores . . . *maximi, rosei*"; but, influenced by the verdict of Torrey & Gray, Lindley in Bot. Reg. xxxiii. t. 7 (1847), showed it again as *H. Moscheutos.* That the northern plant may have the petals roseate or sometimes white with crimson base was recognized by the best early field-botanists of New England, New York, New Jersey and Pennsylvania. Torrey & Gray have already been quoted. Similarly, Barton, describing the plant of the Delaware said "reddish-purple; rarely white".—Bart. Comp. Fl. Phila. ii. 65 (1818).

I have gone into considerable detail in bringing forward the evidence, as I at present see it, that *Hibiscus Moscheutos* and *H. palustris* are perfectly distinct species, although the occurrence

of color-forms with white flowers with crimson centers in the latter has produced a confusion resulting in their merging by those who have not realized their other characters. When we know more intimately the degree of variation of the two in the area, Maryland and eastern Virginia, where both are found, they may prove to merge. At present I lack conclusive evidence that there is more transition than might result from hybridizing[1]. Unusually long-styled plants from the Eastern Shore of Maryland and from Cape May, New Jersey, may eventually prove to be transitional, especially if the smooth-styled plant with conic-ovoid capsule described as *H. oculiroseus* actually originated in southeastern New Jersey. Furthermore, pink-flowered forms of the southern *H. Moscheutos* are suspected; their actual occurrence is not satisfactorily demonstrated. It would have been possible and much quicker[2] dogmatically to assert that the two are distinct, without an analysis of the fundamental literature and the overlooked morphological characters of the two. In view of a rather deeply intrenched conviction that they are merely color-forms of one species, this longer consideration has seemed desirable; too dogmatic assertions, without careful checking of these matters, have already produced sufficient confusion.

Since reaching these tentative conclusions I find that the late Edward Lee Greene, in his characteristically rhetorical manner and without pointing out new characters, came to the same conclusion. In his Leaflets, ii. 64, 65 (1910) Greene wrote:

> Taking Gray's Synoptical Flora for the authority upon our hydrophile kinds of *Hibiscus*, a northern botanist would believe without a doubt that the broad-leaved pink-flowered plant of New England marshes is to be *H. Moscheutos*, Linn. Nevertheless Linnaeus, who rarely distinguished species where they were not well marked, said that this northern plant should be called *H. palustris*. Its leaves are not only broad, but are lobed, and this with some suggestion of the outline of maple leaves. They say that the flowers of this, commonly of a pinkish or light rose-color, are sometimes white. But let the New England plant lover, taught that his northern plant is *H. Moscheutos*, come southward in summer time to the marshes of Chesapeake Bay and its tributaries, and he will be apt to ask

[1] See comments of Dr. A. B. Stout in Addisonia, iii. under *H. oculiroseus*, t. 88 (1918), the flowering specimen not too good a match for Britton's original plate of a fruiting tip nor for the flowering specimen designated by him as TYPE of *H. oculiroseus*.

[2] As the late George Foot Moore used to say? "It isn't the time it takes to point out evident facts which troubles one; it is the time it takes to demonstrate that they have always been known and are not new."

what this hibiscus is that has always large cream-colored corollas, and with long narrow lanceolate and wholly uncut foliage; for he will not believe, unless his faith in great books is immovable, that this and the other are the same.

The northern plant is *H. palustris.* Only the great yellowish-white southern one is *H. Moscheutos,* and it is improbable that any man, either botanist or botanophile, knowing both, will doubt their distinctness. Indeed, one of the most capable of northern botanists, though of an earlier generation, namely Bigelow, knew nothing of any other native hibiscus in Massachusetts than *H. palustris.* A living botanist of the North, and one well travelled, once asked me what this great cream-colored narrow-leaved plant of these southern marshes could be; so confident had he been that the maple-leaved red-flowered one of the North had been authoritatively determined by great men to be what they had called it; and he seemed to think that our plant of these regions must be nondescript.

Nevertheless, Hitchcock & Standley, in Fl. Distr. Columb. 203, 204 (1919), got the wires crossed and defined *H. palustris* as having "Leaves . . . lanceolate or ovate; flowers cream-colored, with crimson eye", a plant known in their area on "Tidal marshes along the Potomac and Eastern Branch [Anacostia] . . . Southeastern U. S."; and they added the comment: "This species has been confused with the pink-flowered *H. Moscheutos* L., found north of our region". Greene had correctly pointed out that the northern plant (see MAP 1) is *H. palustris,* the southern (see MAP 2) *H. Moscheutos.* That much seems certain. Whether they are finally to be considered as two quite distinct species or as extremes of one specific type can be satisfactorily determined only when we understand the series from Cape May, New Jersey and from Chesapeake Bay to False Cape, Virginia. Greene and, after him, Hitchcock & Standley, implied that in the region covered by the Flora of the District of Columbia the only representative of the series is the narrow-leaved and white-flowered southern plant. Similarly in the new Checklist of Plants in the Washington-Baltimore Area (Sept., 1941), covering "the territory extending from the Pennsylvania-Maryland boundary to the Rappahannock River", only this extreme (as *H. palustris,* forma *oculiroseus*) is given. One would, therefore, conclude that the "pink-flowered" plant "found north of our region" does not grow in the Washington-Baltimore area. It is, consequently, important to record that on August 3, 1910, Dr. Francis W. Pennell collected near Alexandria (only a few miles below Washington) three numbers,

2582, 2585 and 2586, which are exceptionally interesting. The first, typical *H. Moscheutos* as here defined (with narrow leaves, white flowers with red eye, leafy-bracted peduncles, and glabrous style-branches) he correctly determined as *H. oculiroseus;* the second, broad-leaved, with roseate corolla and pilose style-branches (true *H. palustris* "found north of our [the Washington] region") he correctly identified, in contrast with *H. oculiroseus*, as *H. Moscheutos* sensu authors of the period; while the third was considered a hybrid between the other two. The characteristic specimen of *H. palustris* from Alexandria is in the Herbarium of the Academy of Natural Sciences of Philadelphia. Other broad-leaved plants with pilose style-branches, depressed capsule or other traits which put them into *H. palustris* are before me from the following stations in the Washington-Baltimore area of Maryland: along the canal, Chesapeake City, Cecil County, *Tidestrom*, no. 11,446 (Gray Herb.); Back Creek, north of Chesapeake City, *B. Long*, no. 42,289, very characteristic fruit (Phil. Acad.); Back Shores, Baltimore, *C. C. Plitt*, no. 686 (Gray Herb.); Back Bay, near Annapolis, *Tidestrom*, no. 11,484 (Gray Herb.); Plumpoint, *G. H. Shull*, no. 167 (Gray Herb.; N. Y.); Patuxent River east of Upper Marlboro, *Wherry & Pennell*, no. 12,402 (Phil. Acad.). It is certainly to be hoped that the projected work, to which the Checklist of September, 1941 is a forerunner, will not merit the criticism of its predecessor: "The logical conclusion actually seems to be that the aim of the new Flora is not to open the path of knowledge to the Flora of the District of Columbia, but to the Flora of the National Herbarium"[1].

Farther south the poorly understood *Hibiscus incanus* Wendl. comes into the problem. Originally described and illustrated as having small and narrow leaves and sulphur-yellow corollas, it is stated by Small to have the relatively short petals sometimes white or pink and to differ from *H. Moscheutos* (*H. oculiroseus* of Small's treatment) in having the capsule ellipsoid and hirsute, instead of conical and glabrous. Considerable material of *H. Moscheutos* from the Carolinas has recently been distributed as *H. incanus* or as a variety of *H. palustris* based upon *H. incanus*. With only inadequate material of the latter species its status in the series remains doubtful.

[1] Theo. Holm, Am. Midl. Nat. v. 175 (1921).

In the following paragraphs I attempt to summarize the more significant bibliography of *Hibiscus palustris* and *H. Moscheutos* and to cite some characteristic illustrations. This treatment, it should be understood, is not necessarily final; in a group with plastic characters finality of judgment is not easily reached.

H. palustris L. Sp. Pl. 693 (1753) as to descr. and citations of Dodens and Gronovius; Willd. Sp. Pl. iii[1]. 806 (1800); Sims in Curt. Bot. Mag. xxiii. t. 882 (1806); Allg. Teutsch. Gart. Mag. iii. t. 19, fig. 2 (1806); Pers. Syn. ii. 254 (1806); Bigel. Fl. Bost. 164 (1814); Barton, Compend. Fl. Phila. ii. 65 (1818); DC. Prodr. i. 450 (1824); Torrey, Compend. 256 (1826); Spreng. Syst. 105 (1826); Nees & Sinning, Samml. Schönblühender Gewächse, 33, t. 15 (1831); Lindl. Bot. Reg. xvii. t. 1462 (1832); Géel. Sert. Bot. Cl. xvi. t. (unnumbered) (1832). *H. Moscheutos* sensu Lindl. Bot. Reg. xxxiii. t. 7 (1847); sensu Meehan's Mo. ii. t. 11 (1892); sensu Dana, How to Know the Wild Fl. t. 75 (1894); sensu Britton in Journ. N. Y. Bot. Gard. iv. 219, t. xvii (1903); sensu Stone, Pl. So. N. J. t. 81 (1911); sensu Stout in Addisonia, iii. t. 99 (1918); sensu House, Wild Fl. N. Y. i. t. 129 (1918); not L. (1753). *H. Moscheutos*, β. *purpurascens* Sweet, Brit. Fl. Gard. iii. sub t. 286 (1829). *H. opulifolius* Greene, Leaflets, ii. 65 (1910). —For statement of characters and range see p. 269.

Forma Peckii (House) House, Bull. N. Y. State Mus. no. 254: 490 (1924). *H. Moscheutos*, f. *Peckii* House, Bull. N. Y. State Mus. nos. 243–244: 54 (1923). *H. palustris* sensu Cav. Diss. 162, t. 65, fig. 2 (1785), descr. "corolla . . . luteo-albicans; petalis unguibus incarnatis". *H. Moscheutos* sensu Sweet, Brit. Fl. Gard. iii. t. 286 (1829). *H. palustris*, var. *albiflorus* Leichtlin ex Kolb in Neubert's Deutsch. Gart. Mag. xl. 193, t. 10 (1887).—The albino.

H. Moscheutos L. Sp. Pl. 693 (1753); Cav. Diss. 163, t. 65, fig. 1 (1785); Willd. Sp. Pl. iii[1]. 806 (1800); Michx. Fl. Bor.-Am. ii. 47 (1803); Pers. Syn. ii. 254 (1806); DC. Prodr. i. 450 (1824); Torrey, Compend. 255 (1826); Spreng. Syst. i. 104 (1826); Nees & Sinning, Samml. Schönbl. Gew. 87, t. 37 (1831); Darby, Man. 50 (1841); Gray, Gen. ii. t. 133 (1849); Schnitzlein, Iconogr. iii. t. 209, fig. 24 (1855); Chapm. Fl. So. States, 57 (1860). *H. palustris* sensu Walt. Fl. Carol. 176 (1788); sensu Hitchc. & Standley, Fl. D. C. 204 (1919); not L. (1753). *H. oculiroseus* Britton in Journ. N. Y. Bot. Gard. iv. 219, t. xviii (1903), as to type and original plate; Small, Man. Se. Fl. 856 (1933). *H. pinetorum* Greene, Leaflets, ii. 66 (1910). *H. palustris*, forma *oculiroseus* (Britton) Fernald in Rhodora, xli. 112 (1939), as to type.

Desmodium glutinosum.—The name *Hedysarum glutinosum*[1] was published by Willdenow in volume III, part 2, of his edition of Linnaeus's Species Plantarum. This, I have recently shown, was published in 1802, not in 1803 as stated by Kuntze[2]. I also pointed[3] out that Michaux's Flora Boreali-Americana (in which *H. acuminatum*[4] was described) was published in 1803. Discovery of the actual dates of publication of these two works answers decisively the long standing question—which of these two is the proper name to use?

DeCandolle, in 1825[5], made the combination *Desmodium acuminatum*, based on Michaux's name and placed Willdenow's name in synonymy. Blake in 1924[6] made the combination *Meibomia acuminata*, and then also indicated the error involved in the application of the name *Desmodium grandiflorum* (Walt.) DC. to Michaux's plant.

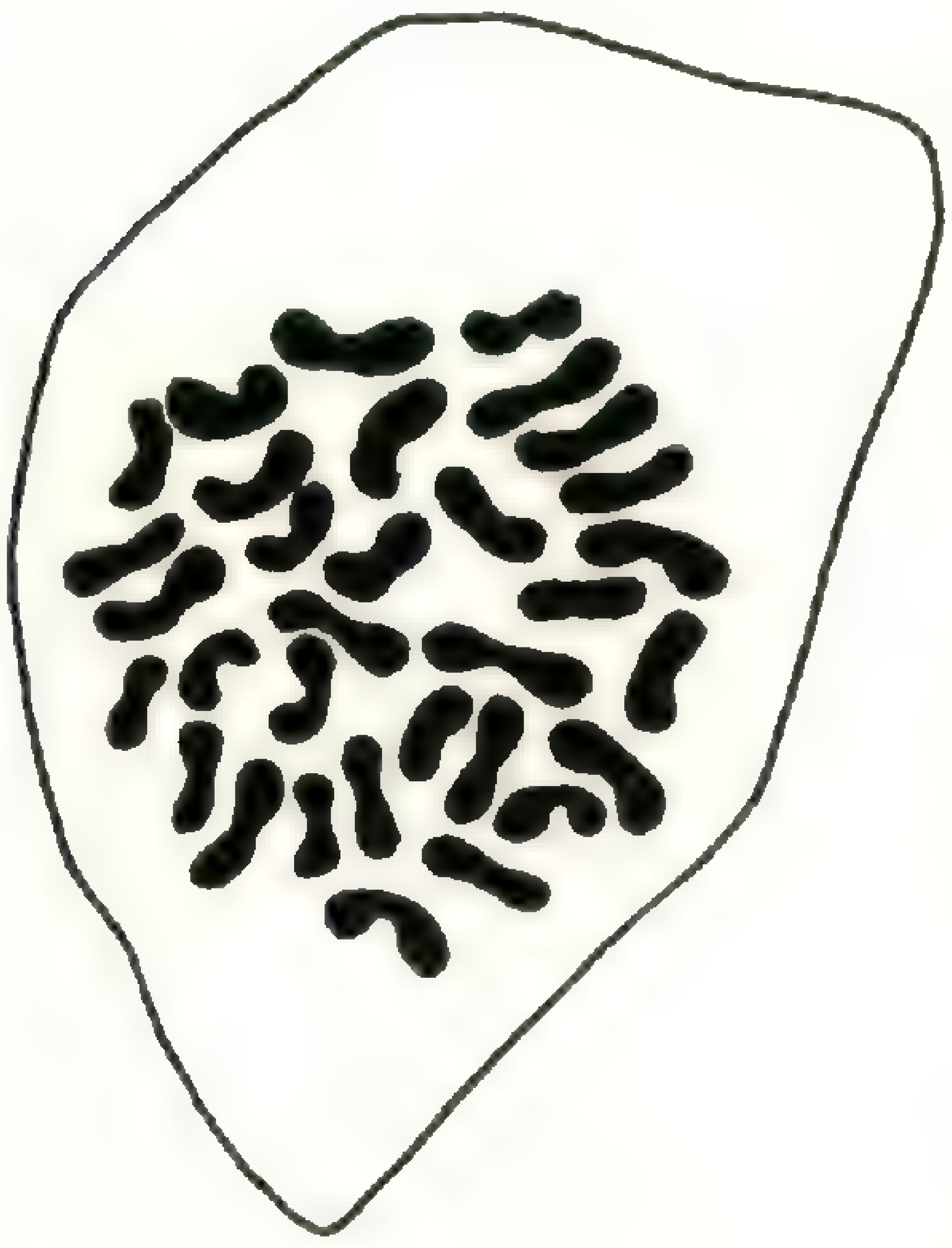
Schindler, in 1926[7], proposed the combination *Desmodium glutinosum*. Although Schindler considered *H. glutinosum* and *H. acuminatum* to have been published simultaneously, he treated the former as the "earliest legitimate epithet"[8] on the basis that the two taxonomically identical names had first been combined in 1813, when Muhlenberg reduced *H. acuminatum* to synonymy under *H. glutinosum*.

Blake and Schindler accepted 1803 as the proper date of publication of Willdenow's name and of Michaux's. Both men also overlooked the combination *Desmodium glutinosum*, published by Wood in his Class Book in 1845[9]. Although it is true that Wood cited neither authority nor synonyms his description leaves no doubt as to his intention nor as to the identity of the plant he was considering. It is a literal translation of Pursh's[10] treatment of *H. glutinosum*, which in turn is an accurate condensation of Willdenow's description and diagnosis of the material sent him by Muhlenberg. Therefore *Desmodium*

[1] Muhl. ex Willd., Sp. Pl. iii^2. 1198 (1802).
[2] Kuntze, Rev. Gen. i. cxxxv. (1891).
[3] See Schubert in Rhodora xliv. 147–150 (1942).
[4] Michaux, Fl. Bor.-Am. ii. 72 (1803).
[5] DC., Prod. ii. 329 (1825).
[6] Blake in Bot. Gaz. lxxviii. 277 (1924).
[7] Schindl., in Fedde, Rep. Spec. Nov. Reg. Veg. xxii. 258 (1926).
[8] Int. Rules Bot. Nomencl. Art. 56 and 60 (2) (1935).
[9] Wood, Class Book of Botany, 120 (1845).
[10] Pursh, Fl. Am. Sept. ii. 483 (1814).

glutinosum (Muhl. ex Willd.) Wood seems to be the correct name to apply to the plant described by Willdenow, and for the plant described by Michaux with which it is identical.[1]—Bernice G. Schubert, Gray Herbarium.

Chromosomes of Jamesianthus.—Blake and Sherff[2] described *J. alabamensis* as the type of a monotypic genus of Compositae with "very close resemblance not only in habit but also in technical characters to the genus *Arnicastrum* Greenm." Dr. Roland M. Harper, who collected the specimens upon which the genus is based, kindly supplied seed of this plant from the original locality: near Russellville, Franklin County, Alabama. Seedlings were grown in the greenhouse.



Plumules, fixed in Carnoy's fluid and smeared in iron-aceto-carmine, were studied cytologically. The chromosome number for three plants was determined. The 2*n*-number at mitotic metaphase is 32 (fig. 1).—Dorothy A. Johnson, Department of Botany, University of Michigan.

[1] For a photograph of the type of *H. glutinosum* I am indebted to Dr. L. Diels of Berlin, and for a fragment of authentic material of *H. acuminatum* to Dr. Francis W. Pennell of the Academy of Natural Sciences in Philadelphia.

[2] Sherff, E. E. A New Genus of Compositae from Northwestern Alabama. Botanical Series Field Museum of Nat. Hist. **22**: 399–403. 1940.

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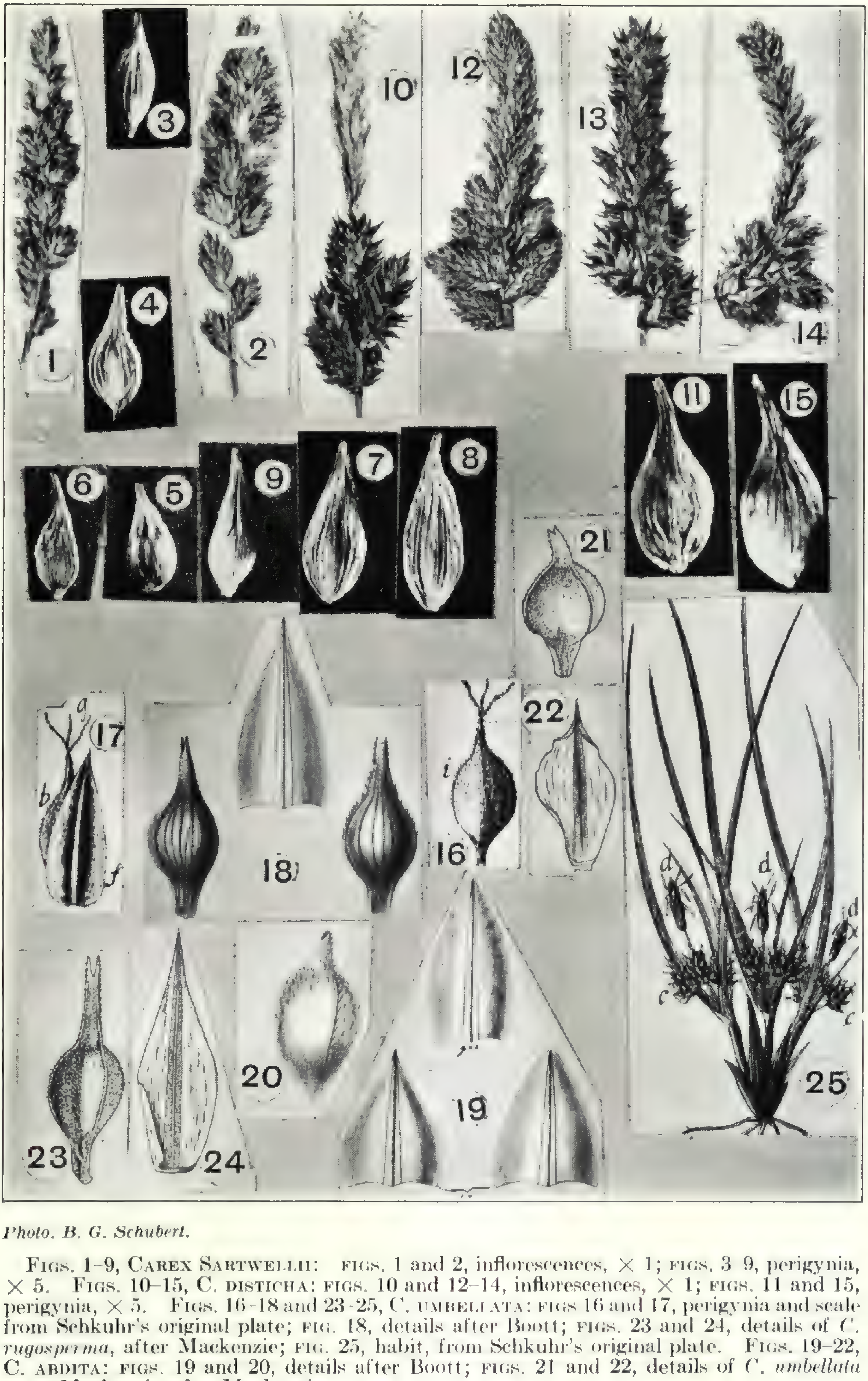

Photo. B. G. Schubert.

FIGS. 1–9, CAREX SARTWELLII: FIGS. 1 and 2, inflorescences, × 1; FIGS. 3–9, perigynia, × 5. FIGS. 10–15, C. DISTICHA: FIGS. 10 and 12–14, inflorescences, × 1; FIGS. 11 and 15, perigynia, × 5. FIGS. 16–18 and 23–25, C. UMBELLATA: FIGS 16 and 17, perigynia and scale from Schkuhr's original plate; FIG. 18, details after Boott; FIGS. 23 and 24, details of *C. rugosperma*, after Mackenzie; FIG. 25, habit, from Schkuhr's original plate. FIGS. 19–22, C. ABDITA: FIGS. 19 and 20, details after Boott; FIGS. 21 and 22, details of *C. umbellata* sensu Mackenzie, after Mackenzie.

Photo. B. G. Schubert.

FIGS. 1 and 3, 4, 7 and 8, CAREX TERRAE-NOVAE: FIG. 1, TYPE, × 1; FIG. 3, inflorescence, × 3; FIG. 4, inflorescence, × 10; FIGS. 7 and 8, perigynia, × 10. FIGS. 2, 5 and 6: C. GLACIALIS: FIG. 2, inflorescence, × 10; FIGS. 5 and 6, perigynia, × 10.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXLIV

CRITICAL NOTES ON CAREX

M. L. Fernald

(Plates 710–716)

While rewriting the treatment of *Carex* for a new edition of Gray's *Manual* so many points have arisen which need clarification that I am attempting their elucidation in the accompanying notes. Several more species need critical study, especially in the section *Vesicariae;* for instance, *C. vesicaria* itself. No one who has seen a good series of typical *C. vesicaria* of Europe can be at all satisfied with the reduction to it of all the diverse North American plants by Mackenzie in the North American Flora. These problems, temporarily interrupted, await further study. It seems desirable, however, to publish the notes on the genus already assembled.

It is to be regretted that it is not possible always to subscribe to the decisions and the splittings and reductions of Mackenzie. Suffering for many years from abnormal vision, he thought he saw, as I personally know from having shared a tent in Gaspé with him, what some others can not detect; and in his work upon the later groups in the North American Flora he had apparently lost his acuteness and "lumped" quite dissimilar plants. This failure in his latest work sharply to discriminate is well shown in his reduction of all variations of *C. inflata* (as *C. rostrata*) to one undivided maze (see PLATES 715 and 716). It is, obviously, unsafe to rely, without careful checking, upon all of

the specific treatments in *Carex*, as presented in the North American Flora.

Carex disticha in North America (Plate 710, figs. 1–15).—*Carex disticha* Huds. Fl. Angl. 403 (1762) or *C. intermedia* Gooden. in Trans. Linn. Soc. ii. 154 (1794) is a variable species of Eurasia, so closely related to the North American *C. Sartwellii* Dew. in Am. Journ. Sci. xliii. 90 (1842) that difficulty has been encountered in separating the two. The common American plant has repeatedly been placed with it, sometimes as *C. disticha*, sometimes as *C. intermedia*, or as *C. disticha*, var. *Sartwellii* Dewey (1866). On the whole, however, the two can be rather readily recognized. *C. disticha* has the leaf-sheaths covering the nodes; in *C. Sartwellii* the upper nodes are exserted. In *C. disticha* the spikes are very unequal in size, oblong or narrowly ovoid, much longer than broad, the summit of the inflorescence continuous and more slender than the base and 2 or 3 cm. long; in *C. Sartwellii* the spikes are usually more uniform, small and globose to ovoid. The scales of *C. disticha* are castaneous, with pale hyaline margins, and acuminate; those of *C. Sartwellii* pale brown and blunter. The differences in the perigynia are not so pronounced as often stated but the prolonged beak in *C. disticha* is more sharply and deeply bidentate than in *C. Sartwellii.*

As to the name *C. disticha* Huds. (1762), Kükenthal, although so calling the plant in his introductory discussion in Das Pflanzenreich, Heft 38, iv[20]. 5 and 9 (1909), rejected the name in his fuller treatment on p. 135, in favor of the later *C. intermedia* Good. (1794), citing in synonymy the *C. disticha* of Lamarck and others, "vix Huds." In view, however, of the unanimous retention of *C. disticha* Huds., with *C. intermedia* as a synonym, by the British botanists (Britten & Rendle in 1907; Druce in 1908; Wilmott in 1922), who should understand Hudson's species, I am returning to that long-used name.

My first object in the present note is to point out the occurrence in Ontario of *Carex disticha*. Its occurrence, possibly as an adventive from Europe, on the shores of the St. Lawrence at the Iles de Boucherville in Quebec, where discovered in 1927, has already been reported by Victorin in his Flore Laurentienne, 706 (1935). In the Gray Herbarium there is an additional Canadian specimen, correctly identified by the late William Boott, col-

lected by John Macoun on June 23, 1866, in a "peat bog near Belleville", Ontario. This material it seems to me is quite characteristic *C. disticha.* One of the inflorescences, × 1, is shown in PLATE 710, FIG. 10, with a perigynium, × 5, as FIG. 11. An inflorescence of the Boucherville plant, also × 1, is shown as FIG. 12; while FIG. 13 is from the Vosges, France, *Raine*, and FIGS. 14 and 15 from Stockholm, *Ostman.* Although it is possible that the plant of the St. Lawrence at Boucherville, like some others which have recently established themselves near Montreal, may be a recent adventive, derived from straw and litter thrown out at the latter port, the fact, that in 1866 John Macoun collected the species in a natural bog near Belleville, suggests the desirability of watching carefully for it in that region, where it is probably indigenous.

In his treatment of *Carex Sartwellii* in the North American Flora, xviii[1]. 37 (1931), Mackenzie, correctly citing Dewey's type as Sartwell material from Junius, Seneca County, New York, describes the perigynia as "ovate-orbicular, 2.5–3 mm. long, 1.5–1.75 mm. wide, . . . the body . . . abruptly contracted into a serrulate beak"; and Dr. F. J. Hermann, accepting without evident question Mackenzie's definition of the perigynium, described in 1938 a plant of Indiana as *C. Sartwellii*, var. *stenorrhyncha* F. J. Hermann in RHODORA, xl. 78 (1938) with gradually beaked elliptic perigynia 4–4.5 mm. long and 1–1.3 mm. broad, stating that the perigynia suggest those of *C. intermedia* (*C. disticha*) in length but not breadth, and in being "sessile to very short-stipitate," etc. I do not know how Mackenzie arrived at his statement of size (2.5–3 mm. long and 1.5–1.75 mm. wide) and the orbicular tendency in the perigynia of *C. Sartwellii.* Of the Sartwell collections which Dewey had there are 6 lots; in addition there are other collections from Junius, coll. *Sartwell*, in the Gray Herbarium, as well as others from Montezuma and from Buffalo. These are to me inseparable from the TYPE of var. *stenorrhyncha* and from many other collections of *C. Sartwellii* from farther west. FIG. 1 is an inflorescence, × 1, of the Junius plant, coll. *Sartwell* and originally named by Dewey *C. Sartwellii*, later changed by him to *C. disticha.* FIG. 2 is an inflorescence, × 1, from the TYPE of var. *stenorrhyncha.* The two look alike. FIG. 3 is a perigynium, × 5,

3.5 mm. long and 1.4 mm. broad, from the Dewey (*Sartwell*) material; FIG. 4, another × 5, 4.5 mm. long, also from Dewey (*Sartwell*) material; FIGS. 5 and 6 are two perigynia, × 5, each 3–3.5 + mm. long, one 1.5 mm. broad, the other 1 mm. broad, from Montezuma, New York (*Eames, Randolph & Wiegand*, no. 11,575); FIG. 7 is a perigynium, × 5, 4 mm. long and 1.5 mm. broad, from Port Huron, Michigan, *Dodge*, no. 52; FIG. 8, one, × 5, 4.8 mm. long, from Grass Lake, Michigan, July 1, 1858, *Wm. Boott;* and FIG. 9 a perigynium, × 5, from the TYPE of var. *stenorrhyncha*. I see no fundamental difference by which the latter can be set off; neither do I see the orbicular tendency in the perigynia nor that they are "abruptly contracted into a . . . beak".[1]

C. INTERIOR Bailey, forma **keweenawensis** (F. J. Hermann), stat. nov. Var. *keweenawensis* F. J. Hermann in Am. Midl. Nat. xxv. 19 (1941).

Although Hermann surmised that his var. *keweenawensis* is a highly localized variety, endemic on the Keweenaw Peninsula, I am incapable of separating from his type scattered collections from throughout much of the range of the species (southern Labrador Peninsula, Newfoundland, Quebec, New York, Minnesota, Nebraska, British Columbia and California). The plant with inner face of the perigynium nerved, not otherwise different from the commoner plant with nerveless inner faces, seems to me a minor form, rather than a true geographic variety.

C. SCOPARIA Schkuhr, forma **subturbinata** (Fernald & Wiegand), stat. nov. Var. *subturbinata* Fernald & Wiegand in RHODORA, xiv. 116 (1912).

C. CRISTATELLA Britton, forma **catelliformis** (Farwell), stat. nov. Var. *catelliformis* Farwell in Papers Mich. Acad. ii. 17 (1923).

[1] Most unfortunately, quite similar inaccuracies in measurements pervade Mackenzie's work in the North American Flora. Those who rely upon them are bound to be seriously misled. In the species almost immediately following *C. Sartwellii* we find *C. gravida* defined with "head . . . 1–2.5 cm. long . . . ; perigynia 4 mm. long, 2 mm. wide", although specimens clearly marked by Mackenzie as *C. gravida* in the Gray Herbarium show heads more than 5 cm. long, and perigynia 5.5 mm. long and 3 mm. wide; while material identified by Mackenzie as his own *C. aggregata*, described as having "perigynia . . . 3.25–4.5 mm. long, about 2 mm. wide", shows plenty of them 5.5 mm. long and more than 3 mm. wide. Mackenzie, who essentially lost his eyesight in his later years, used to take pride in not needing a lens, for he had "microscopic vision". Possibly he overestimated the precision of his abnormal eyes. At least, one who has hoped to lean with assurance upon his measurements finds it unsafe to do so. It is necessary to start anew!

C. NORMALIS Mackenz., forma **perlonga** (Fernald), comb. nov. *C. mirabilis* Dewey, var. *perlonga* Fernald in Proc. Am. Acad. xxxvii. 473, t. 2, fig. 27 (1902). *C. straminea* Willd., var. *mirabilis* Tuckerm., forma *perlonga* (Fernald) Kükenthal in Engler, Pflanzenr. iv[20]. 207 (1909). *C. normalis*, var. *perlonga* (Fernald) Burnham in Torreya, xix. 131 (1919).

Carex normalis, forma *perlonga*, occurring more or less throughout the range of typical *C. normalis*, is merely a form, but it is helpful to have a designation for it. In the typical form of the species the head is compact, 1.5–4 cm. long, made up of crowded to subapproximate spikes. In forma *perlonga* the spikes are all (or all but the terminal) remote in a flexuous, moniliform inflorescence 3–7 cm. long. Treated by Mackenzie (N. Am. Fl.) as of no consequence, plants of it with arching moniliform inflorescences 5–7 cm. long are bound to perplex those who attempt to reconcile it with his "erect head 2.5–5 cm. long."

C. CUMULATA (Bailey) Mackenz., forma **soluta,** f. nov., inflorescentiis moniliformibus ad 1 dm. longis, spicis 0.7–2 cm. distantibus.—NOVA SCOTIA: sphagnous pool back of barrier beach near mouth of Broad River, Queens County, August 16, 1920, *Fernald & Bissell*, no. 20,311 (TYPE, in Herb. Gray.).

Typical *Carex cumulata* has the spikes approximate or densely crowded in a head 1–4.5 cm. long; but, while some heads of no. 20,311 are typical of the species, most of them are as prolonged and lax as in the most extreme specimens of *C. silicea* Olney. Although Mackenzie marked no. 20,311 as his *C. cumulata*, its moniliform heads up to 1 dm. long could not be identified by his key (N. Am. Fl.), "spikes . . . densely aggregated", nor by his further definition of the species with "head 2–4 cm. long". Forma *soluta*, however, has the characteristic loose sheaths, broad and stiff leaf-blades, conic-ovoid and truncate-based spikes which place it in *C. cumulata;* and the presence in the clumps of some typical condensed heads clearly show its specific identity.

C. HORMATHODES Fern., forma **invisa** (W. Boott), stat. nov. *C. straminea*, var. *invisa* W. Boott. in Bot. Gaz. ix. 86 (1884). *C. tenera*, var. *invisa* (W. Boott) Britton in Britt. & Brown, Ill. Fl. i. 358 (1896); Fernald in Proc. Am. Acad. xxxvii. 475, t. II, fig. 35 (1902). *C. hormathodes*, var. *invisa* (W. Boott) Fern. in RHODORA, viii. 166 (1906). *C. straminea*, var. *tenera*, forma *invisa* (W. Boott) Kükenth. in Engler, Pflanzenr. iv[20]. 206 (1909).

Typical *C. hormathodes* is the larger extreme of the species,

0.2–9.5 dm. high, with spikes 8–15 mm. long and 5–9 mm. thick, the perigynia 4.8–6 mm. long. Forma *invisa* is the small extreme, mostly 1.5–3 dm. (sometimes –6 dm.) high, the spikes only 5–8 mm. long and 3–6 mm. thick, the perigynia only 4–5 mm. long. In both forms the head varies from moniliform and arching or flexuous to somewhat crowded and erect, and on late culms (second flowering), the spikes are often densely aggregated and increased in number, up to 15, instead of 3–9, as in the first inflorescences.

C. caryophyllea a Valid Name.—In recent years some continental Old World botanists have thrown aside the name *Carex caryophyllea* Latourrette, Chlor. Lugd. 27 (1785) in favor of *C. verna* Chaix in Villars, Hist. Pl. Dauph. i. 312 (1786) and ii. 204 (1787). Their argument was stated by Schinz & Thellung in their paragraphs in Vierteljahrss. Naturforsch. Gesellsch. Zurich, liii. Heft 4: 524 (1908):

Carex verna [Chaix in Vill. Hist. pl. Dauph. I (1786), 312 ("Hall. 1381"), nomen nudum] Vill. l. c. II. (1787), 204.
Carex caryophyllea Latourette [Chlor. Lugd. (1785), 27, nomen solum teste Hayek Sched. fl. stir. exs. 11/12 (1907), 5] ex A. et G. Syn. d. mitteleur. Fl. II, 2 p 123 (1902).

Schinz & Thellung quote Janchen to the effect that Latourrette cited as standing for his *Carex caryophyllea* "Haller nr. 1381," exactly the same number which was first cited (in 1786) by Chaix in Villars in publishing *C. verna*, a publication which, in case of *C. verna*, they characterized as a *nomen nudum*, while of *C. caryophyllea*, published with the same citation, they said "nomen solum". The International Rules of Botanical Nomenclature are as definite as rules can be which are stated as negations, that (Art. 37) "A name of a taxonomic group is not validly published unless it is . . . accompanied by a description of the group or *by a reference to a previously and effectively published description of it*" (italics mine); and, again (Art. 44) "The name of a species or of a subdivision of a species is not validly published unless it is accompanied (1) by a description of the group; or (2) by the citation of a previously and effectively published description of the group under another name; or (3) by a plate or figure with analyses showing essential characters; but this applies only to plates or figures published before January 1, 1908."

Both Latourrette in 1785, in publishing *Carex caryophyllea*, and Chaix in 1786, in his first publication of *C. verna*, met the requirement by citing Haller's beautifully described no. 1381. Latourrette's very brief item, under *Carex*, was

Caryophyllea, *N. Haller*, 1381. Lugd. & Delph. [localities].

The almost as brief publication of *Carex verna* by Chaix in Villars (1786) was as follows, under *Carex*.

verna (mihi): Hall. 1381: passim in collibus apricis (4).

When the account of Haller in his Hist. Stirp. Helv. ii. 192 (1768) is looked up we find, as we have learned to expect from that great student, an account almost unequaled for clarity. Omitting his enumeration of specimens and a comment which does not bear on the immediate question, we have as diagnoses and citations the following:

1381. CAREX foliis cespitosis, brevibus, spicis confertis, petiolis erectis brevibus; capsulis ovato triquetris.†
Gramen caryophyllatae foliis, spica divulsa. C. B[auhin]. *Theatr.* p. 46.
Cyperoides alpinum, Caryophyllatae foliis, spicis tenuibus, e fusco rufescentibus. SCHEUCHZER. p. 433.
Habitus caryophylleus. Folia cespitosa, brevia: firma, ad duas lineas lata, linea exarata, eminente nervo, retrorsum ducto digito aspera. Culmi trientales. Spicae in summa planta congestae. Mascula crassior, obesa, rufa, glumis cinnamomeis, nervo virescente divisis, ovatis. Feminae duae, tres, graciliores breviores, per maturitatem latescentes, capsulis hirsutis, ovato triquetris, absque rostro. Petiolus in ima spica aliquot linearum, suprema sessilis, marem contingit. Insident glumis aristatis.

What could better define *Carex caryophyllea*, a plant with short and firm, scabrous, spreading leaves (suggesting those of *Dianthus*), thick-clavate staminate spike with rufescent scales, and two or three pistillate spikes with hirsute trigonous-ovoid perigynia subtended by awn-tipped scales? These characters distinguish the species as usually defined. It is rarely that phytographers, from Linnaeus to our modern authors, give so lucid accounts of their species. There seems to be no ground for treating *C. caryophyllea* Latourrette as a "nomen" only, nor *C. verna* Chaix in Villars as a "nomen nudum".

Schinz & Thellung, von Hayek and others who have abandoned *Carex caryophyllea* presumably have done so because Haller's

descriptions were in a non-binomial work. The diagnoses and often the illustrations of Haller, like those of Scheuchzer, are superior. There seems to be no sufficient reason for not taking up binomials based upon Haller's descriptions, when those based upon Scheuchzer's are admitted, nor when so many of the Linnean genera and species rest wholly on earlier non-binomial accounts.

The Type of Carex umbellata (Plate 710, figs. 16–25).—*Carex umbellata* Schkuhr ex Willd. Sp. Pl. iv. 290 (1805) and Riedgr. Nacht. 75, t. W w w, fig. 171 (1806) was clearly described with *ovate-lanceolate* pistillate *scales* about equaling the *ovoid*, beaked *perigynium:* "fructibus ovatis pubescentibus rostratis ore integris, squamam ovato-lanceolatam aequantibus" and again "Squamae *ovato-lanceolatae membranaceae albae.*" Schkuhr's plate (our figs. 16, 17 and 25) clearly showed the ovoid and long-beaked perigynium and the acuminate-cuspidate ovate-lanceolate scale. Francis Boott correctly understood the plant when, in his Ill. Carex, ii. 99, t. 292 (1860), he illustrated the "squamae ovatae . . . vel lanceolatae, acuminato-cuspidatae" and the long-beaked perigynia (our fig. 18). At the same time he described *C. umbellata*, var. *brevirostris* Boott, l. c. t. 294, with shorter-beaked and shorter obovoid perigynia and obtuse to merely acute broadly ovate scales: "perigyniis minoribus . . . obovatis . . . , rostro 2/10 lin. longo, . . . squama late ovata obtusa vel acuta . . . brevioribus." Boott's plate of var. *brevirostris* was clear. From it I have taken scales (reduced from the original) and perigynia (our figs. 19 and 20). Bailey and, later, I accepted Boott's decision and in 1913 in Bull. Torr. Bot. Cl. xl. 551 (1913) Mackenzie also did so; and in 1902 I described as *C. umbellata*, var. *tonsa* the glabrous-fruited plant which Boott had shown in his t. 293.

That the three are reasonably distinct species now seems apparent. The *narrow* (1.5–3 mm. broad)- and relatively soft-*leaved plant*, true *C. umbellata* Schkuhr, with *pistillate scales lance-ovate and gradually tapering to long or acuminate tips*, has the finely *pubescent perigynia* 3.2–4.7 *mm. long, with ellipsoid-ovoid or -obovoid body* 1.25–2.2 *mm. thick, the beak* 0.9–1.7 *mm. long*. The narrow- and softer-leaved plant with *scales ovate or ovate-oblong and short-tipped*, the *perigynia* 2.2–3.3 *mm. long,*

with globose-obovoid bodies 1–1.3 *mm. thick, the beak only* 0.5–1 *mm. long,* is *C. abdita* Bicknell in Bull. Torr. Bot. Cl. xxxv. 492 (1908) = *C. umbellata,* var. *brevirostris* Boott. The coarser plant, with *hard and firm erect leaves becoming* 2.5–5 *mm. broad, the large and long-beaked perigynia* essentially *glabrous,* is *C. tonsa* (Fern.) Bicknell, l. c. = *C. umbellata,* var. *tonsa* Fern.

This interpretation of *C. umbellata* was the unanimous one until, in Bull. Torr. Bot. Cl. xlii. 621 (1915), Mackenzie wrote: "A careful study of Schkuhr's plate of *Carex umbellata* has thoroughly convinced me that what he had was a plant with short-beaked perigynia, named *C. abdita* by Bicknell." Consequently Mackenzie gave to his correct *C. umbellata* of his treatment of 1913, the plant with "scales lance-ovate, short-cuspidate to acuminate, . . . perigynia 3.25–4.25 mm. long, the body short-oval", etc., the new name *C. rugosperma;* and those botanists who undiscriminatingly think that the "last word" is necessarily the best have forthwith taken up *C. rugosperma.*

In the North American Flora, xviii[4]. 204, 205 (1935), therefore, Mackenzie treats as *C. umbellata* the smaller and softer plant, *C. abdita* Bicknell, with "scales ovate, abruptly acute, acuminate or cuspidate, . . . perigynia 2.25–3.25 mm. long, the body subglobose, . . . 1–1.25 mm. wide, . . . abruptly contracted into a short (0.5–1 mm. long) beak"; and at the same time he maintained his *C. rugosperma* for the plant with lance-ovate and acuminate scales and with larger and longer-beaked perigynia with the body "short-oval."

If one compares the illustrations of perigynia and pistillate scales in Mackenzie's North American Cariceae, i. pl. 234, of *Carex* "*umbellata*" sensu Mackenzie or *C. abdita* Bicknell (our FIGS. 21 and 22) and those of his *C. rugosperma,* the *C. umbellata* of Boott, Bailey, Fernald and in 1913 of Mackenzie (our FIGS. 23 and 24) and then takes into account the fact that the very long beak in Mackenzie's plate of the latter (his pl. 235) is very extreme (the beak commonly much shorter than there shown), it will be apparent that the shape of the scale and of the perigynium-body of true (Schkuhr's) *C. umbellata* (our FIGS. 16 and 17) are much closer to those of *C. rugosperma* (our FIG. 18) than to those of *C.* "*umbellata*" sensu Mackenzie, not Schkuhr (our FIGS. 19–22). The original description of Schkuhr ex Willdenow

clearly defined the perigynia as ovate, the scales as ovate-lanceolate; for his *C.* "*umbellata*" Mackenzie as definitely says, body of perigynium "subglobose", the "scales ovate". In view of these facts I find myself reducing *C. rugosperma* to *C. umbellata* Schkuhr. When one considers the interchangeable character of the scale, in Schkuhr's original *C. umbellata* "ovate-lanceolate", in Mackenzie's *C. rugosperma* "lance-ovate", he is reminded (if he ever reads such nonsense) of one of the scaly characters of Stephen Leacock, who imagined that he had altered his identity by reversing his name from Vere de Lancy to Lancy de Vere and so far succeeded that his original name was unknown on shipboard except by "the captain, the purser, the steward, and the passengers".

A life-size photograph of Schkuhr's type, secured by Dr. Svenson, who kindly presented the Gray Herbarium with a copy, shows the prolonged-acuminate scales of *C. rugosperma* and should dispose of the doubts of those who take Mackenzie's verdicts as law. Unfortunately, the prints, sent from Halle without the negative, are too black for reproduction.

As to *Carex umbellata*, var. *vicina* Dewey, which in the North American Flora Mackenzie places in the synonymy of his *C.* "*umbellata*" (i. e. *C. abdita*), it should be noted that Dewey's type belongs in true *C. umbellata* Schkuhr (*C. rugosperma* Mackenzie).

C. RICHARDSONII R. Br., forma **exserta,** f. nov., spicis foemineis valde exsertis pedunculis imis 1.8–3.3 cm. longis. ILLINOIS: Augusta, *S. B. Mead,* in Herb. Gray.

Typical and widespread *Carex Richardsonii* has the bases of the pistillate spikes included in or barely exserted from the colored sheaths. In restudying the species I had marked fig. 475 in Gray, Man. ed. 7, 240 as "impossible"; but search of the material in the Gray Herbarium reveals the wholly unusual sheet of the formerly unrecognized forma *exserta* as having been used as the basis for fig. 475 in the Manual. Fig. 475, then, is a good illustration of forma *exserta*, not of typical *C. Richardsonii.*

CAREX **terrae-novae,** sp. nov. (TAB. 711, FIG. 1, 3, 4, 7, 8), *C. glaciali* habitu simillima; vaginis inferioribus plerumque pallide brunneis; culmis 1–12 cm. altis; bracteis spathiformibus; spicis foemineis sessilibus vel subsessilibus densifloris, rhachi recti glabro; squamis caducis; perigyniis anguste ovoideo-

ellipsoideis fusiformibus 2–2.5 mm. longis, basi angustatis substipitatis, rostro 0.3–0.5 mm. longo.—Calcareous barrens of northern and western NEWFOUNDLAND: turfy slopes of slaty hills, Little Quirpon, August 6, 1925, *Fernald & Long*, no. 27,658; dry limestone barrens, northern half of Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald et al.*, no. 27,655; sandy and clayey spots in limestone gravel-barrens, Boat Harbor, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 27,656; gravelly and peaty limestone barrens back of Big Brook, Straits of Belle Isle, July 15, 1925, *Fernald & Long*, no. 27,652; limestone barrens west of Big Brook, July 16, 1925, *Long & Gilbert*, no. 27,653; limestone barrens on the Highlands northeast of Big Brook, *Fernald, Wiegand & Hotchkiss*, no. 27,654; dry gravelly limestone barrens, Savage Point, Straits of Belle Isle, July 13, 1925, *Fernald et al.*, no. 27,650; dry horizontal limestone, Rock Marsh, Flower Cove, Straits of Belle Isle, July 30, 1924, *Fernald, Long & Dunbar*, no. 26,428; limestone barrens near Ice Point, St. Barbe Bay, July 14, 1925, *Wiegand, Gilbert & Hotchkiss*, no. 27,651; damp clay pockets in limestone gravel, Brig Bay, August 6, 1924, *Fernald, Long & Dunbar*, no. 26,429; forming close turf in peaty pockets in limestone ledges, Plum Point, Brig Bay, August 8, 1924, *Fernald, Long & Dunbar*, no. 26,430; dry gravelly limestone barrens, St. John Island, St. John Bay, July 31, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,657 (TYPE in Herb. Gray.); gravelly crests of limestone sea-cliffs at base of Pointe Riche, July 22, 1929, *Fernald, Long & Fogg*, no. 1411; dry gravelly limestone barrens, Pointe Riche, July 24, 1929, *Fernald, Long & Fogg*, no. 1412; dry limestone barrens, upper slopes and tablelands, altitude 200–300 m., Table Mountain, Port au Port Bay, August 16, 1910, *Fernald, Wiegand & Kittredge*, no. 2894; dry exposed ledges and shingle on the limestone tableland, alt. 200–300 m., Table Mountain, July 16 and 17, 1914, *Fernald & St. John*, no. 10,796; summit of 1st dome, Table Mountain, July 24, 1921, *Mackenzie & Griscom*, no. 10,147; dry limestone barrens, Green Gardens, Cape St. George, July 18, 1922, *Mackenzie & Griscom*, no. 11,022.

The earliest collections were distributed as *Carex pedata* Wahlenb., all the others as *C. glacialis* Mackenzie; the latter name published by Mackenzie in Bull. Torr. Bot. Cl. xxxvii. 244 (1910) for *C. pedata* Wahlenb. (1812), not L. (1763), with reference only to the European plant. In the North American Flora, xviii[4]. 221, Mackenzie treats the Newfoundland plant, along with that of Greenland, Ellesmereland, Mackenzie and Yukon, as identical with the arctic-alpine European species; but the plant of Newfoundland differs in so many characters that I find it very

difficult to consider it as belonging to *C. glacialis* (*C. pedata* Wahlenb.). The plant of Greenland, and Ellesmereland, thence west across Arctic America and south to Baffin Island (*Malte, Polunin*), Cape Mugford, Labrador (*Potter & Brierly*, nos. 2389 and 2390) and Lake Athabasca, Saskatchewan (*Raup*, no. 6521), seems to be very characteristic *C. glacialis;* the Newfoundland plant as clearly not.

Carex glacialis (*C. pedata* Wahlenb.) usually (but not always) has the bases purplish ("vaginae inferiores purpureae"—Kükenthal); *C. terrae-novae* very rarely so, the lowest sheaths being drab or pale brown in most cases, only 4 out of the 18 collections at hand showing a slight purplish tone. The lower bract of *C. glacialis* is subtruncate and usually ends in a slender but short hirtellous blade (fig. 2), ("Bracteae ad vaginas breves truncatas coloratas reductae, ima plerumque lamina brevi setacea munita" —Kükenthal); in *C. terrrae-novae* the lower bract (figs. 3 and 4) is obliquely sheathing, much more scarious than in *C. glacialis*, and its very exceptional minute blade is smoother. In well developed *C. glacialis* the lower spike is clearly peduncled (fig. 2), standing definitely out of the truncate bract, but in the most dwarfed extremes it may be subsessile; in *C. terrae-novae* (figs. 1 and 3) it is sessile or barely short-peduncled. The pistillate spikes of *C. glacialis* are lax and open, with a flexuous and hirtellous rachis ("spicis subpedunculatis sparsifloris"—Wahlenberg; "laxe 2–5-florae . . . rhachis flexuosa"—Kükenthal); in *C. terrae-novae* the pistillate spikes (figs. 3 and 4) are densely few-flowered, the straight and smooth rachis usually hidden by the imbricated perigynia. In *C. glacialis* the perigynia promptly fall, leaving the flexuous rachis clothed with the persistent and distant scales; in *C. terrae-novae* the pistillate scales are caducous, leaving the rachis covered by sub-persistent imbricated perigynia. In *C. glacialis* the perigynia (figs. 5 and 6) are broadly obovoid and only slightly narrowed at base, 2 mm. long, with a relatively short beak with oblique orifice, and slightly persistent style-base ("capsulis subglobosis apiculatis"—Wahlenberg; "Utriculi . . . orbiculato-ovati . . . 2 mm. longi . . . , basi contracti, apice in rostrum breve . . . saepe obliquum ore hyalino . . . abrupte abeuntes"—Kükenthal); in *C. terrae-novae* the more slender perigynia (figs. 7 and 8) are 2–2.5 mm.

long, tapering to a substipitate slender base and to a longer beak with subtruncate orifice. In *C. terrae-novae*, furthermore, the styles (FIG. 8) are apparently longer and their indurated bases more regularly persistent in the fruit.

Whether the staminate scales and the anthers of *Carex terrae-novae* differ materially from those of *C. glacialis* I cannot yet determine. The material is all past flowering.

C. PALEACEA Wahlenb., forma **erectiuscula** (Fernald), comb. nov. *C. maritima*, var. *erectiuscula* Fernald in RHODORA, ii. 170 (1900).

Since the familiar name, *Carex maritima* O. F. Muell. (1777), is antedated by *C. maritima* Gunner (1772) we have to take up for the maritime member of *Carex*, § *Cryptocarpae*, the name *C. paleacea* Wahlenb. in Svensk. Vet.-Akad. Nya Handl. xxiv. 164 (1803). In RHODORA, xxxv. 397 (1933) I most stupidly assumed (and consequently reaped the almost certain reward for so doing) that Wahlenberg's plant was the Scandinavian form of the species, there with tendencies to smaller parts (stature, leaf-breadth, size of spikes, length of beak, etc.) than the American plant (eastern Labrador to the lower St. Lawrence, south to Massachusetts; and shores of James Bay). I, consequently, too hurriedly named our American plant *C. paleacea*, var. *transatlantica*. Sad to confess, the type of *C. paleacea* Wahlenberg was the American plant. Wahlenberg took it to be a distinct species from the Scandinavian *C. maritima* of O. F. Mueller, describing the two, one after the other on the same page. Wahlenberg supposed his *C. paleacea* to be "*C. paleacea* SCHREB. in *Mühlenb.* Act. Amer?" and its habitat was given as simply: "*Hab.* in America boreali; secundum herbarium Cl. *Torneri*". A beautiful photograph of the TYPE, most generously sent me by Professor Alm in December, 1934, when he graciously pointed out my inexcusable blunder, shows the smallest northern extreme of our coastwise plant, such as occurs chiefly at the northern limit of the specific range with us. It presumably came from the Labrador Peninsula.

Mackenzie explicitly says in N. Am. Fl. xviii.[7] 414, "Type from Greenland". In view of the Scandinavian authorship of the species this was a plausible assumption but there is nothing in Wahlenberg's "*Hab.* in America boreali" to support it. The

species was not included by Lange in his compendious works on the Greenland flora; neither is it in Ostenfeld's Flora Arctica, nor in his detailed enumeration of all known plants of Greenland; nor did Polunin find any evidence of it in the Canadian Eastern Arctic. In the Gray Herbarium there is an old specimen labeled in the hand of someone else: "legit Vahl. e Groenlandia", but it can hardly be taken, in view of the failure of the closest students of the Greenland flora to find it, as evidence that the type of *C. paleacea,* communicated by Torner as from North America, came from Greenland.

As to "*C. paleacea* Schreb. in *Mühlenb.* Act. Amer?", Wahlenberg doubtless meant *C. paleacea* Schreber ex Muhl. in Trans. Amer. Phil. Soc. iii. 179 (1793). This, merely a *nomen,* did not get recorded in *Index Kewensis.* It was in Muhlenberg's (Muhlenberg then and thereafter used the unmodified u, not ü, in his name) *Index Florae Lancastriensis.* It was an undescribed species of Schreber, with whom Muhlenberg was in regular correspondence, but, published simply as "*Carex,* Seg [Sedge] *paleacea,* Schreberi, N. S.", it can be treated only as a *nomen nudum.* Dewey and others took up Wahlenberg's *C. paleacea* as based upon the Lancaster (Pennsylvania) plant and Dewey made a varietal combination, *C. crinita,* β. *paleacea* (Wahlenb.) Dew. in Am. Journ. Sci. x. 270 (1826); but, as above indicated, the Wahlenberg type is conspecific with *C. maritima* O. F. Muell.

Forma *erectiuscula* was thought by me in 1933 to be a possible hybrid of *Carex paleacea* and *C. salina,* var. *kattegatensis.* There is such a hybrid but the type and several other collections (from Anticosti and the coast of Maine) show no traces of the latter plant. They seem to be an extreme of *C. paleacea* with very short and short-peduncled erect pistillate spikes. In this character they break down the statements in familiar keys. For example, Mackenzie's key says of *C. paleacea* "lower spikes normally pendulous"; "commonly" would have been better.

As to the keys in Kükenthal's treatment of § *Cryptocarpae,* they throw one into the hopeless despair suffered so frequently in trying to follow *Das Pflanzenreich.* Stoloniferous and halophytic *C. maritima* (*C. paleacea*) is there separated from its halophytic and stoloniferous allies (*C. salina, C. Lyngbyei,* etc.), with which it hybridizes, and is put with *C. crinita,* to which it has no close

relationship. *C. salina* is distinguished in his key by "Culmus 10–30 cm altus . . . Spiculae ♀ 3–4 mm late erectae. Squamae . . . aristatae vel mucronatae". Nevertheless, under the fuller treatment of *C. salina* and its varieties and forms we get "Culmus validus 60–90 cm. altus"; "Spiculae ♀ . . . longe capillari-pedunculatae pendulae"; "Spiculae ad . . . 1 cm latae"; and "Squamae ♀ obtuse". It is not remarkable that students become confused in trying to use the treatments!

Carex aquatilis Wahlenb., var. **altior** (Rydb.), comb. nov. *C. variabilis* Bailey, var. *altior* Rydb. in Mem. N. Y. Bot. Gard. i. 76 (1900). *C. variabilis*, var. *elatior* Bailey in Mem. Torr. Bot. Cl. i. 19 (1889), not *C. aquatilis*, var. *elatior* Bab. Man. 341 (1843). *C. aquatilis*, var. *substricta* Kükenthal in Engler, Pflanzenr. iv[20]. 309 (1909). *C. substricta* (Kükenth.) Mackenz. in Rydb. Fl. Rocky Mts. 139 (1918), in N. Am. Fl. xviii.[7] 398 (1935) and N. Am. Cariceae, ii. pl. 458 (1940). Plate 712, figs. 1–3 and 5–7.

Typical *Carex aquatilis* of Scandinavia (perigynium, × 10, in fig. 4) and other parts of northern Eurasia has the culms, to quote Kükenthal, obtusely angled and smooth (Culmus . . . obtusangulus laevis). Examination of some scores of Old World sheets shows this to be the case. In its dwarf northernmost extreme this character holds, as does the elliptic to elliptic-obovate nerveless perigynium, the more northern and low plants sometimes separated as var. *stans* (Drejer) Boott, or even as a species, *C. stans* Drejer. The latter seems to be only a dwarfed state and hardly worth varietal or even formal recognition. *C. aquatilis* in North America is common from the Arctic southward to exposed areas of Newfoundland, the tablelands of Cape Breton, the Gaspé Peninsula, shores of James Bay, and along the Cordillera to New Mexico and California. In the southern part of its range, from Newfoundland to British Columbia, south to Nova Scotia, northern and western New England, northern New Jersey, New York, Ohio, Indiana, Wisconsin, Missouri, Nebraska, Colorado and Oregon, it is gradually replaced by a coarser extreme (sometimes up to 1.5 m. high), with broader leaves, longer spikes (up to 10 cm. long and 3–7 mm. thick), the perigynia more broadly ovate to obovate, with rounded summits and usually obscurely nerved. The upper 1–3 decimeters of the relatively slender and firm culm of this southern extreme are

acutely angled and either smooth or scabrous. This is *C. substricta* (Kükenthal) Mackenzie. Upon the not too constant shape of the perigynium *C. aquatilis* and *C. substricta* are separated thus in the North American Flora:

"Perigynium narrowly to very broadly elliptic, broadest below apex, less than 3 mm. long, 1–1.5 mm. wide.....457. *C. aquatilis.*
Perigynia strongly obovate, broadest at the apex, 3 mm. long, 1.75 mm. wide..........................458. *C. substricta.*"

Mackenzie cites *C. aquatilis* as extending south in the East only to Quebec (the Gaspé Peninsula), while the only material of the group recognized by him from Maine is his *C. substricta.* It is, therefore, unfortunate that, in an attempt to display the "specific" difference in the perigynia, he should have selected for illustration of the boreal *C. aquatilis* a specimen from central Maine at an altitude of about 100 feet (Orono, *Fernald,* July 9, 1900), for the Orono plant, 1.5 m. high and with thick pistillate spikes 3–7 cm. long (for *C. aquatilis* Mackenzie says 1–4 cm.) is the best kind of *C. substricta!* The result is that Mackenzie's illustration of the perigynium, made from a large specimen of *C. substricta,* shows an obovate perigynium, not an elliptic one as demanded by his key for *C. aquatilis.*

It is unfortunate also that Kükenthal's *C. aquatilis,* var. *substricta,* the basis of Mackenzie's specific name, should be cited by Mackenzie in the North American Flora (pp. 397 and 398) in the synonymy of both *C. substricta* and *C. aquatilis.* Cited as a pure synonym of *C. aquatilis* it had its "Type from eastern North America"; cited as the basis of *C. substricta* it was designated as having its "Type probably from Junius, Seneca County, New York". Kükenthal had given the range, without designated type "Atlantisches Nordamerika: Newfundland; Canada bis Assiniboia (J. Macoun n. 16687!); Vereinigte Staaten nur im Nordosten, von Maine and Vermont (Pringle!) bis New York (Sartwell n. 56!), Pennsylvanien, Ohio and Minnesota". Since Mackenzie has chosen as type *Sartwell's* no. 56, that may stand as the type; but his "probably from Junius" suggests that Mackenzie did not take the trouble to look up no. 56. This was, of course, in the usually well known 2-volume *Carices Americae Septentrionalis Exsiccatae,* edidit H. P. Sartwell, M.D. Penn Yan, Nov. Ebor. Pars I, 1848, Pars II, 1850. No. 56, with the regular printed label, says "*Junius, New York*";

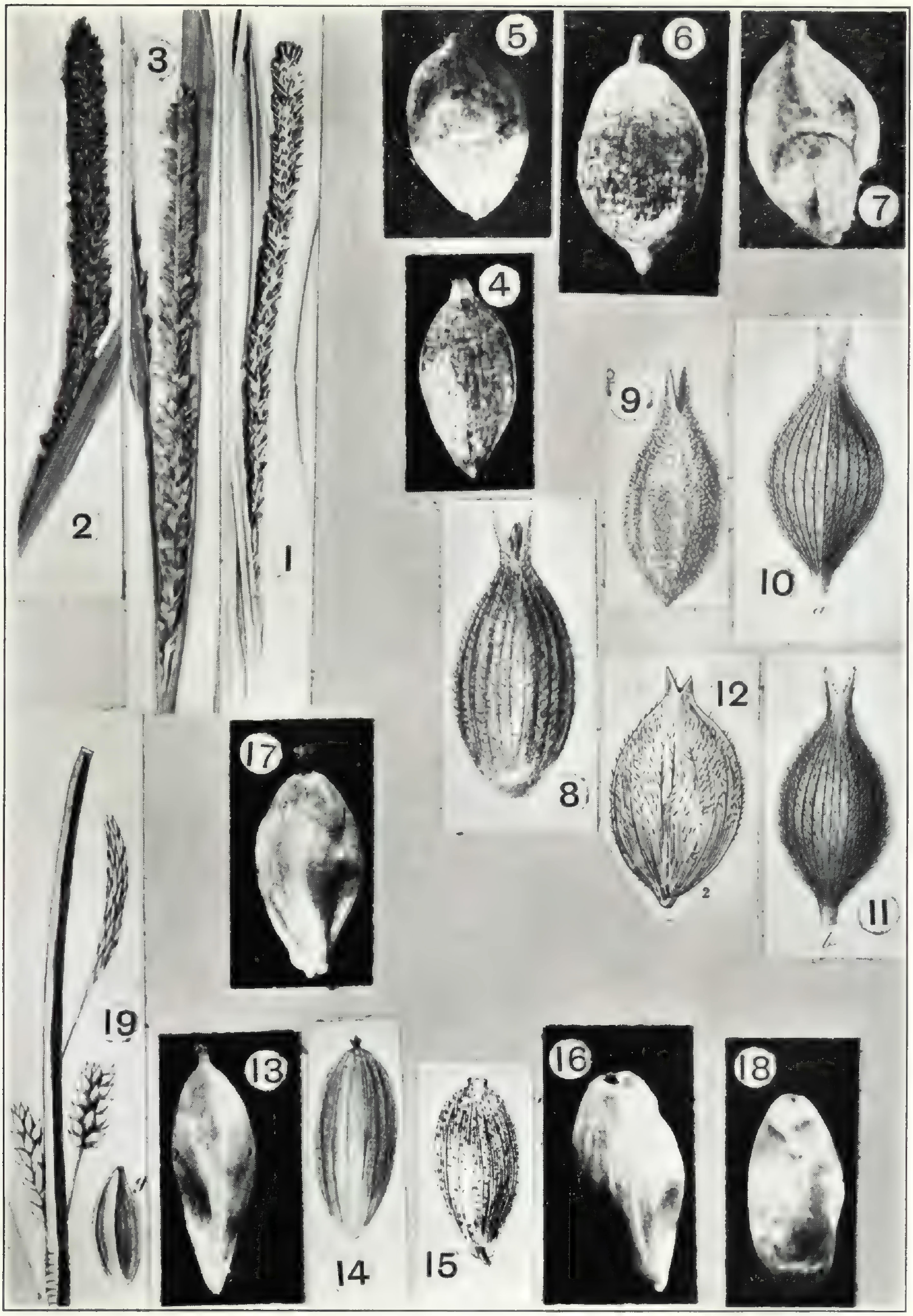

Photo. B. G. Schubert.

FIG. 4, typical CAREX AQUATILIS: perigynium, × 10, from Lapland. FIGS. 1–3 and 5–7, var. ALTIOR: FIG. 1, pistillate spike, × 1, from TYPE; FIG. 2, pistillate spike, × 1, from ISOTYPE of *C. substricta;* FIG. 3, pistillate spike, × 1, from topotype of *C. substricta;* FIGS. 5–7, perigynia, × 10, from spikes shown in FIGS. 1–3 respectively.

FIGS. 8–12, C. LASIOCARPA: FIG. 8, perigynium of European type, after Lindman; FIG. 9, perigynium of European type, after Host; FIGS. 10 and 11, perigynia of var. AMERICANA, after Boott; FIG. 12, perigynium of var. OCCALTANS, after Akigama.

FIGS. 13–19, C. PALLESCENS: FIGS. 13–15 and 19, typical European plant: FIG. 19, inflorescence and perigynium of *C. undulata* Kunze, after Kunze; FIG. 13, perigynium, × 10; FIG. 14, perigynium, after Host, FIG. 15, after Boott. FIGS. 16–18, perigynia, × 10 of var. NEOGAEA.

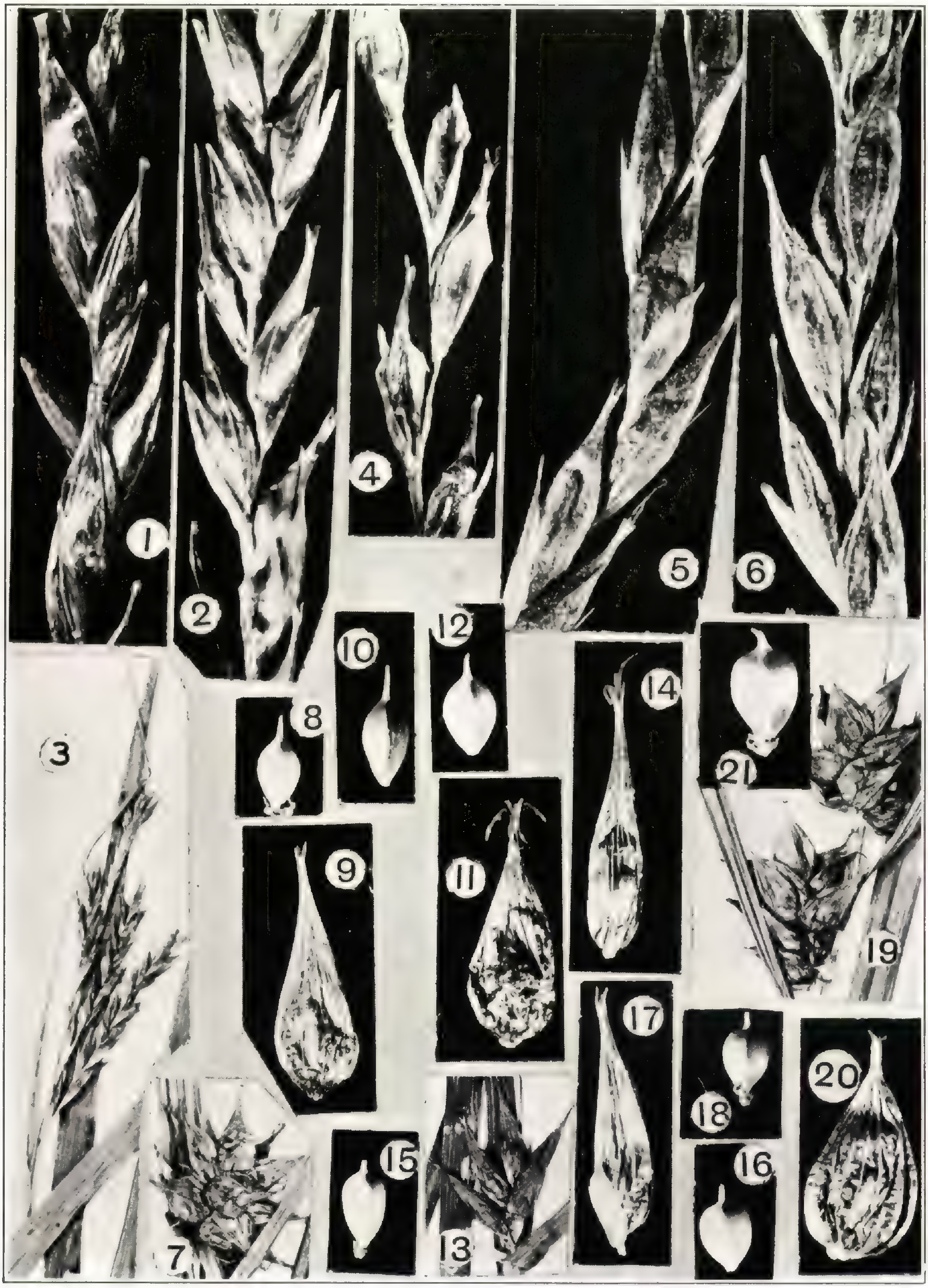

Photo. B. G. Schubert.

FIGS. 1–6, pistillate spikes of varieties of CAREX DEBILIS, × 5 (FIG. 3, × 1): FIG. 1, var. TYPICA; FIG. 2, var. RUDGEI; FIG. 3, var. STRICTIOR; FIG. 4, var. INTERJECTA; FIG. 5, var. PUBERA; FIG. 6, var. INTERCURSA.

FIGS. 7–21, C. INTUMESCENS: FIGS. 7–12, typical C. INTUMESCENS: FIG. 7, pistillate spike, × 1; FIGS. 8, 10 and 12, achenes, × 2; FIGS. 9 and 11, perigynia, × 2. FIGS. 13–18, var. FERNALDII: FIG. 13, pistillate spike, × 1, from TYPE; FIGS. 14 and 17, perigynia, × 2; FIGS. 15, 16 and 18, achenes, × 2. FIGS. 19–21, var. FERNALDII, forma VENTRIOSA, all from TYPE: FIG. 19, pistillate spikes, × 1; FIG. 20, perigynium, × 2; FIG. 21, achene, × 2.

there is no "probably"; and of course Sartwell knew his own country.

It is natural that Mackenzie should have been confused in separating as species his *C. substricta* and the more boreal *C. aquatilis*. Everyone who faces a stack (in my case a stack 2 feet high) of specimens is bound to become confused in attempting to sort them. So long as one deals only with the plant of the Arctic and Subarctic, extending down to Newfoundland and Gaspé and along the mountains in the West, as contrasted with those from New England to southern Manitoba and Missouri, he is on fairly clear ground. When he tackles the transition areas, however, the characters become hopelessly confused. The material from northern Alberta to Colorado is particularly difficult to sort into two exclusive piles. In that area Mackenzie's policy of placing Kükenthal's *Carex aquatilis*, var. *substricta* under two species was partly justified.

On the whole, however, the large temperate American series with the culms acute-angled above, with broader leaves, longer spikes and more obovate and often nerved perigynia, stands off as a good geographic variety—that is all. It was clearly described in 1889 as *C. variabilis* Bailey, var. *elatior* Bailey in Mem. Torr. Bot. Cl. i. 19 (1889). At that time Bailey proposed for the Rocky Mountain representatives of *C. aquatilis* a species which he called *C. variabilis*, ibid. 18, differing from *C. aquatilis* in having "culm sharply angled, roughish on the angles", etc.; and for the taller extreme, "much taller", with "spikes often 3 to 4 inches [7.6–10.1 cm.] long", he proposed *C. variabilis*, var. *elatior*. Under the latter he cited three specimens: "Canon City, Colorado, *Brandegee;* open thickets, Morley 'Foot-hills of Rocky Mts', and Donald, Columbia Valley, B. C. *Macoun*". In the North American Flora, where his *C. substricta*, with "sharply triangular" culms "smooth or roughened above" with spikes "usually 3–6 cm. long", is distinguished from his *C. aquatilis*, with culms "obtusely triangular below . . . smooth throughout or somewhat roughened above", and with spikes only "1–4 cm. long", Mackenzie places without question *C. variabilis*, var. *elatior* in the synonymy of true *C. aquatilis*. He there designates as type of Bailey's var. *elatior* the Brandegee specimen from Canon City. This, clearly marked by Bailey, is

in the Gray Herbarium. With its firm and slender culms acutely angled and scabrous and its spikes (FIG. 1) up to 7 cm. long it is to me inseparable from much slender-spiked *C. substricta*, for instance an isotype (*Sartwell*, no. 56 our FIG. 2) in the Gray Herbarium and a topotype (*Wiegand*, no. 1842, our FIG. 3), the former with the lowest spike 6 cm. long, the latter with it 7.5 cm. long. Strikingly enough the perigynium (FIG. 5, × 10) of the Canon City TYPE of *C. variabilis*, var. *elatior* is fully as rounded-ovate (Mackenzie says obovate) as in *Sartwell*, no. 56 (FIG. 6, × 10), isotype, and in *Wiegand*, no. 1842 (FIG. 7, × 10), topotype of *C. substricta*. There seems to me no question that *C. aquatilis*, var. *substricta* (1909) and *C. variabilis*, var. *elatior* (1889) belong together. Since, however, there is a *C. aquatilis* var. *elatior* Bab. (1843), a European variety with culms and perigynia of true *C. aquatilis*, it is necessary to take up the name *C. aquatilis*, var. *altior*, based on *C. variabilis*, var. *altior* Rydb. (1900), a substitute for Bailey's var. *elatior* and resting, for typification, upon it.

C. Bigelowii Torr., forma **anguillata** (Drejer), comb. nov. *C. anguillata* Drejer, Nat. Tidskr. iii. 454 (1841). *C. rigida*, var. *concolor*, f. *anguillata* (Drejer) Kükenth. in Engler, Pflanzenr. iv[20]. 302 (1909).

I quite agree with Polunin, Bot. Can. East. Arct. pt. i. 130 (1940), that there is no clear line to separate *Carex anguillata* from *C. Bigelowii*, and since it is scattered through the range of the latter it is best treated as a forma. Polunin, after studying the type of *C. concolor* R. Br. Chlor. Melv. 25 (1823), preserved at the British Museum, states, with the concurrence of both Wilmott and Dandy, that it is *C. aquatilis* Wahlenb., var. *stans* (Drej.) Boott. He also notes that Simmons had already suspected as much. Phytogeographically this is as it should be. *C. Bigelowii* (*C. concolor* sensu Mackenzie) is a pronounced oxylophyte; *C. aquatilis* is often decidedly calcicolous. *C. concolor* R. Br. came from one of the limestone islands, Melville Island, of the Arctic Archipelago. In his then exhaustive Phytogeography of the Arctic American Archipelago[1], Simmons was unable to cite *C. Bigelowii* (*C. rigida* of Am. auth. perhaps not Good., and not Schrank; *C. concolor* sensu Mackenzie, not R.

[1] Lunds Univ. Årsskr. n. f. Afd. 2, ix[19] (1913).

Br.) on the Archipelago from west of granitic eastern Baffin Island, making special note of its absence from the calcareous western islands; but the frequently calcicolous *C. aquatilis*, var *stans* was cited by him from many parts of the Archipelago, including three collections from Melville Island. Although Mackenzie, in N. Am. Fl. xviii[6]. 380 (1935), gives his *C. concolor* (i. e. *C. Bigelowii*) the broad range, "Greenland to Alaska, and southward to the mountains of New Hampshire and northern New York", he had seen material only from Greenland, Ungava and Labrador to northern New England and northern New York and "Mackenzie, Alaska"; nothing from the Arctic Archipelago.

Typical *Carex Bigelowii* has linear-cylindric and elongate pistillate spikes, in its type-area (the White Mountains of New Hampshire) mostly 2–5 cm. long and 3–5 mm. thick, with the perigynia and scales rather loosely disposed, the usually long-peduncled staminate spike 1–2.5 cm. long and commonly well overtopping the pistillate. The common plant of northern Europe has the densely flowered thick-cylindric spikes mostly 1–2 cm. long and 3–7 mm. thick, the usually short staminate spike overtopped at base by the pistillate ones. It is very different from typical *C. Bigelowii*, though probably passing into it northward. It is, therefore, surprising to find in the treatment of Mackenzie, who saw species in *C. anguillata* and many other minor forms or varieties, thirty or more names of European forms placed in the synonymy of the chiefly eastern North American *C. Bigelowii* (Mackenzie's *C. concolor*). It is impossible to keep one's tongue out of his cheek as he reads Mackenzie's characterization of these European "names . . . proposed of no systematic value." It is certain that Mackenzie had never seen authentic material nor types of most of these and their citation by him does not reflect actual understanding of them. In view of the complexity of the species, I refrain from selecting the proper name for *C. rigida* Goodenow. That is a problem for the European.

C. NIGRA (L.) Reichard, var. **strictiformis** (Bailey) comb. nov. *C. vulgaris* Fries, var. *strictiformis* Bailey in Mem. Torr. Bot. Cl. i. 74 (1889). *C. rigida* Good., var. *strictiformis* (Bailey) Bailey in Journ. Bot. xxviii. 172 (1890). *C. Goodenoughii* Aschers., var. *strictiformis* (Bailey) Kükenthal in Engler, Pflanzenr. iv[20]. 316 (1909).

The name *Carex nigra* (L.) Reichard, Fl. Moeno-Francofurtana, ii. 96 (1778) was based directly on *C. acuta α. nigra* L. Sp. Pl. ed. 2, ii. 1385 [1388], no. 35 (1763), where the treatment of *C. acuta* L. was identical with that of L. Sp. Pl. ed. 1, ii. 978, no. 28 (1753). *C. acuta* L. consisted of two varieties: *α. nigra*, which was *Carex nigra verna vulgaris* of Flora Lapponica, no. 330 (1737), growing "*in siccioribus*"; and β. *ruffa*, which was a tall aquatic ("*in aquosis*"). *C. nigra* (L.) Reichard antedates by seven years *C. nigra* All. Fl. Pedem. ii. 267 (1785), the name generally used for an alpine species of § *Atratae*, occurring in Europe and western Asia. *C. nigra* All., a later homonym, must be replaced either by *C. parviflora* Host (1801) or by *C. bina* Schkuhr (1801). That is for Europeans to settle; and *C. parviflora* C. A. Meyer (1831), maintained by Kükenthal, cannot be used because of *C. parviflora* Host (1801) and of *C. parviflora* Gaudin (1804). Meyer's species apparently becomes *C. melanocephala* Turcz. (1856).

Carex nigra (L.) Reichard was revived by G. Beck (Beck von Mannagetta) in his Flora von Nieder-Österreich, i. 136 (1890). It is the same as *C. Goodenowii* J. Gay in Ann. Sci. Nat. sér. 2, xi. 191 (1839), as *C. vulgaris* Fries, Mant. 153 (1842), as *C. Goodenoughii* Asch. Fl. Brand. i. 776 (1864) and as *C. acuta* sensu Mackenzie in Bull. Torr. Bot. Cl. l. 345 (1923) and in N. Am. Fl. xviii[6]. 388 (1935). In L. Sp. Pl. ed. 2, ii. 1388 (1763) and in later editions of the Linnean works, including Fl. Lapp. ed. 2: 265 (1792), edited and emended by Sir James Edward Smith who had the Linnean Herbarium, the identity of *C. acuta α. nigra* and *C. nigra verna vulgaris* was reaffirmed. Reichard drew his binomial, *C. nigra*, directly from *C. acuta α. nigra;* Gay, in publishing *C. Goodenowii*, cited as the first synonym *C. nigra verna vulgaris,* followed by *C. acuta α. nigra;* Fries, describing his *C. vulgaris,* also cited "Carex *vulgaris* nigra [changing the emphasis to '*vulgaris*']. *Linn. Lapp. n. 330*"; and Beck von Mannagetta, reviving *C. nigra*, gave only the synonyms "L. (als Var. α. der *C. acuta*) . . . —*C. Goodennouwii* Gay . . . (richtiger *C. Goodenoughii* [neither of Beck's spellings agreeing with Gay's original *Goodenowii*]—*C. vulgaris* Fries". It is difficult to find any doubt concerning the identity of *C. nigra* (L.) Reichard.

Carex acuta L. (1753), having consisted of two varieties, *α. nigra* and β. *ruffa*, which soon proved to be not closely related, the first author who satisfactorily distinguished one of them as a separate species automatically determined which element should retain the name *C. acuta*. In taking out *C. nigra*, based upon *C. acuta α. nigra*, Reichard solved the question; there was nothing left of *C. acuta* but β. *ruffa*. When, furthermore, in Trans. Linn. Soc. ii. 203 (1794), Goodenough definitely identified *C. acuta* as the *C. gracilis* of Curtis, Flora Londinensis, and described it as a relatively large plant reaching a height of 2 feet or more, with harsh culms, with 2 or 3 staminate spikes each 1–3 inches long, with foliaceous bracts overtopping the inflorescence, and with pistillate flowering spikes pendulous, he was restricting *C. acuta* to *C. gracilis* Curtis.

Goodenough erred in citing as a synonym of *Carex acuta*, as interpreted by him, *C. acuta* β. of Flora Suecica, ed. 2, no. 857 (1755) instead of *C. acuta α.* of that work, for the two varieties, α. and β. of Species Plantarum (1753) were reversed in Flora Suecica; but Goodenow's detailed description shows all who can read his excellent Latin that he was not describing *C. nigra verna vulgaris*. However, in arguing against the good usage of European botanists for one and a half centuries, in keeping *C. acuta* L. in the sense of *C. gracilis*, the late K. K. Mackenzie, in Bull. Torr. Bot. Cl. l. 343–345 (1923), laid his stress on the confusion prior to 1753 and upon his private dictum, that the "alpha variety" must be taken as type of a species. There is no justification for the latter argument and surely our nomenclature begins with 1753, not with 1737 or other earlier dates. The interpretation of Linnean species of 1753 should stop there, unless they depend primarily on descriptions of earlier date. If, seeking back of that for pre-Linnean (prior to 1753) meanings of names, we should insist on the ancient interpretations as more important than those of 1753 we should get into a hopeless maze. Careful and scholarly botanists have wisely decided to stop at 1753. Of course, if new light is discovered, showing that there has been serious error in identification, reconsideration is necessary. In case of the two components of *C. acuta* of 1753 there is no new information. In 1753 both elements were *C. acuta*. The withdrawal from the pair of *C. nigra* in 1778 left as

C. acuta the other member of the pair. This was clearly described in 1794 by Goodenough as true *C. acuta*. That should settle the matter. Nothing but confusion results from an attempt to disturb typifications so adequately made by those who understood what they were doing.

Carex nigra (*C. Goodenowii*) has several European varieties which are not known in America, while var. *strictiformis*, closely cespitose and tall (up to 7.5 dm.), with scattered and relatively loose pistillate spikes, is apparently confined to eastern North America. Beck von Mannagetta and Kükenthal have defined those of Europe, some of them considered endemic European species by good students of the genus. It certainly seems as if the 3½-page bibliography under the misidentified *C. acuta* in the North American Flora might well have been reduced by the omission of many scores of names of plants which are not known to occur anywhere in North America.

CAREX STYLOSA C. A. Meyer, var. **nigritella** (Drejer), stat. nov. *C. nigritella* Drejer in Nat. Tidssk. iii. 450 (1841).

Although it has been the custom, ever since Kunze's uniting of the two, to treat *Carex nigritella* of Greenland, Labrador, Newfoundland and eastern Saguenay County, Quebec, as identical with *C. stylosa* of southern Alaska, there seems to be good ground for treating the plant of the North Atlantic area as varietally distinct. When he described *C. stylosa* from Unalaska, Meyer, in Mém. Acad. St. Pétersb. Sav. Étr. i. 222, t. 12 (1831), accompanied his very full description by a beautiful plate, showing the slenderly ellipsoid and subacute perigynia long-attenuate and "quasi" stipitate, the ellipsoid-obovoid achene gradually rounded at summit and with attenuate base; and the leaves were described as subrigid. Unfortunately, our old collections of *C. stylosa*, presumably containing an isotype, are all interned in Sweden so that I am now unable to examine them; but a few Alaskan sheets, most kindly sent me for study from the New York Botanical Garden, and some recent collections from there by Miss Scamman and by Mr. Erling Porsild well agree with Meyer's description and plate. They show the well developed perigynium to be slenderly ellipsoid and 3–3.5 mm. long, and mostly equaled or exceeded by the scales; whereas the more broadly obovoid perigynia of var. *nigritella* are 2–2.5 mm. long and much longer

than the scales. The achene of *C. stylosa* is as shown by Meyer; that of var. *nigritella* shorter and more rounded-oblong, shorter-stipitate, and with broadly rounded to subtruncate summit. In *C. stylosa* the foliage is harshly scabrous, in var. *nigritella* less so or nearly smooth. The inner band of the leaf-sheath in *C. stylosa* is most often friable, in herbarium-specimens usually fractured; whereas, the inner band of var. *nigritella* is more durable and usually unbroken in the old dried material.

When Drejer described his *C. nigritella* he specially contrasted it with *C. stylosa*, emphasizing the more durable inner band of the leaf-sheath and other characters not so good. Kunze, Suppl. Riedgr. 115. t. xxix, promptly reduced *C. nigritella* and practically all botanists for a century have followed his interpretation. Kunze's plate, however, showed only the Alaskan plant, with the characteristic perigynium and achene, from Sitka, and he did not illustrate *C. nigritella*. Francis Boott, following Kunze, illustrated as the southern Alaskan *C. stylosa* a plant from Greenland (*C. nigritella*), showing the short-oblong achene subtruncate at summit, with the style either erect or depressed (the latter tendency frequent in var. *nigritella*); but, as a concession to the type-region of *C. stylosa*, he added details of the Alaskan plant, with longer and ellipsoid more gradually tapering achene, as in Meyer's original plate and as in the Alaskan specimens. *C. nigritella* was beautifully shown in Fl. Danica, xiv. fasc. xl. t. mmcccclxix (1843), here again with the characteristic achenes of the eastern plant, one of them shown with depressed style-base.

C. MEDIA R. Br., var. **Stevenii** (Holm), comb. nov. *C. alpina*, var. *Stevenii* Holm in Am. Journ. Sci. ser. 4, xvi. 21, 27 (1903); Fernald in RHODORA, xxxv. 223, t. 248, figs. 5 and 10 (1933). *C. Vahlii*, var. *Stevenii* (Holm) Fernald in RHODORA, xxxv. 398 (1933). *C. angarae*, var. *Stevenii* (Holm) A. E. Porsild in RHODORA, xli. 204 (1939).

I fully agree with Porsild that the woodland and relatively southern *Carex angarae* Steud. (1855) is specifically distinct from the arctic-alpine plant of northern Eurasia and from Greenland to northern Newfoundland, the Shickshock Mts. of Gaspé and the northern shores of Hudson Bay. The distinctive characters were stated by me in RHODORA, l. c. 222 and 224, and then illustrated. In taking up for the woodland plant of Asia and North America the name *C. angarae* (1855) Mr. Porsild

overlooked *C. media* R. Br. in Richardson in Frankl. Journ. 750 (reprint, 22) and ed. 2: 763 (reprint, 35) (1823). Brown's species, under the synoptic heading "4. *Spicis androgynis pedunculatis*" was clear:

356. C. media: spicis androgynis ternis brevissime pedunculatis sessilibusve approximatis basi masculis, stigmatibus tribus, capsulis ovato rostellatis glaberrimis squama ovata obtusiuscula longioribus. *Brown, MS.* (W) [W, "wooded country from latitude 54° to 64° north"].
Prope C. bicolorem. *Br.*

As to the name *C. Vahlii* Schkuhr (1801) for the arctic-alpine plant with strongly granular-papillose short- and straight-beaked trigonous-obovoid perigynia only 2–2.5 mm. long, Dr. V. Kreczetowicz, Fl. U. S. S. R. iii. 183 (1935) points out that *C. norvegica* Retz. Fl. Scand. Prodr. 179 (1779) antedates *C. norvegica* Willd. (1801) and is identical with *C. Vahlii* Schk. (1801). Retzius in his ed. 2: 219 (1795)—I have not seen ed. 1—gave a sufficiently clear characterization of the plant which has passed as *C. alpina* Lilj. (1798), not Schrank (1787), as *C. Halleri* Gunn. (1772) in small part only, not as to type) and as *C. Vahlii* Schkuhr (1801). The description of Retzius and his citation of Flora Danica, t. 403, which is a crude figure of the arctic-alpine plant (Retzius said "Pl[anta] alp."), cited by Mackenzie under *C. Vahlii*, and the further citation by Retzius of the Norwegian element of *C. Halleri* (not the Haller plant which must be taken as type of *C. Halleri*[1]), leave no question that for the much named *C. Halleri* Gunn. (1772), exclusive of type, *C. alpina* Lilj. (1798), and *C. Vahlii* Schkuhr (1801) we must, unfortunately, take up the name *C. norvegica* Retz. (1779). The maritime *C. norvegica* Willd. becomes *C. Mackenziei* V. Kreczetowicz, l. c. (1935).

C. lasiocarpa Ehrh., var. **americana,** var. nov. (tab. 712, fig. 10 et 11), a var. *typica* europaea recedit bracteis vix vaginatis, squamis foemineis plerumque aristatis vel cuspidatis; perigyniis ovoideo-ellipsoideis 3–4.5 mm. longis, 1.7–2 mm. latis, rostro perbrevi dentibus 0.2–0.5 mm. longis; achenio ellipsoideo.—Peaty meadows, swales, pond-margins, bogs, etc., Newfoundland to British Columbia, south to northern New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Manitoba, Saskatchewan, Idaho and Washington. Type: open sphagnous bog, Argyle, Yarmouth County, Nova Scotia, July 9, 1920, *Pease & Long*, no. 20,519 (in Herb. Gray.).

[1] For discussion see Fernald in Rhodora, xxxv. 220, 221 (1933).

Carex lasiocarpa, var. *americana* is the transcontinental and usually very familiar plant with involute-filiform or canaliculate slender leaves which has regularly passed either as *C. filiformis*, sensu authors, not L., or as *C. lasiocarpa* Ehrh. It is beautifully illustrated in Boott, Ill. Carex, i. t. 132 (1858) as *C. filiformis*, Boott's plate made, not from the type-area (Sweden) of *C. filiformis* of authors, but from Rhode Island material (our FIGS. 10 and 11). It is also well illustrated in Mackenzie, N. Am. Cariceae, ii. pl. 385 (1940). In both these plates the prevailingly cuspidate to aristate scale, the shape of the perigynium and its very short teeth, the outline of the achene, and the sheathless or barely sheathed lower bract are all brought out, Boott's figures of perigynia and scales here partly reproduced as FIGS. 10 and 11.

Typical *Carex lasiocarpa* of Europe and western Asia has the lowest bract either sheathless or with a tubular sheath up to 1.5 cm. long. In var. *americana* it is difficult to find more than a suggestion of a sheath. In typical Eurasian *C. lasiocarpa* the pistillate scales are much less often aristate than in the American plant. The perigynium of the Eurasian type (FIGS. 8 and 9) is more slender and longer (4–6 mm. long) and with longer teeth (0.7–1 mm. long); and its achene is more obovoid than in the American. The perigynia of typical Eurasian *C. lasiocarpa* are accurately shown in Host, Gram. i. t. 86 (1801) as *C. filiformis*—here reproduced as FIG. 9, and in Lindman, Svensk Fanerogampl. fig. 108^2 (1918)—here reproduced as FIG. 8.

Were true *Carex lasiocarpa*, of Europe and of Asia eastward from the Ural to Lake Baikal, and var. *americana* alone to be considered, the latter would have some claim to specific segregation. In eastern Asia, however, in Manchuria, China, Japan, etc., *C. lasiocarpa*, var. *occultans* (Franchet) Kükenthal has the perigynia (FIG. 12) as short and as short-toothed as in var. *americana*, but they are less pubescent and often longer-beaked, and the pistillate scales are more like the average run on the Eurasian plant. Var. *occultans* seems to be a variety about midway between typical *C. lasiocarpa* and var. *americana*, its perigynium (our FIG. 12) well shown in Akiyama's Consp. Caricum Jap. fig. 170 (1932); while some plants of Kamtchatka are scarcely separable from the American plant.

Carex pallescens L., var. **neogaea,** var. nov. (tab. 712, fig. 13–18) perigyniis apice late rotundatis erostratis ore depresso.—Meadows, grasslands, thickets and glades, Newfoundland to Ontario, south to Nova Scotia, New England, New Jersey, Pennsylvania, Ohio and Michigan. Type from wet clearing in spruce woods along Gander River, Glenwood, Newfoundland, July 12 and 13, 1911, *Fernald, Wiegand and Darlington,* no. 4918, in Herb. Gray.

Carex pallescens, var. *neogaea* is the common plant of eastern North America which regularly passes with us as *C. pallescens.* True *C. pallescens* L. Sp. Pl. ii. 977 (1753), with "*Habitat in* Europae *paludibus*", occurs over much of temperate Europe and western Asia (lacking, according to Kükenthal, in most of Arctic Europe, the Iberian Peninsula and the southernmost Mediterranean region). Its range does not connect with the North American area by way of Iceland and southern Greenland, and it is essentially unknown in eastern Asia. Realizing that long isolation without connecting colonies might have resulted in some constant differences I have tried every character. In habit, foliage and general characters of bracts, spikes, scales, perigynia and achenes the two series are similar. The better developed European material has the perigynia sometimes longer than in the American, but some of the smaller European forms show no difference from ours in their size. One apparently constant difference, one of real significance, comes out. In the Eurasian plant the perigynium (figs. 13–15 and 19) is gradually rounded or tapering to a definite, though extremely short, beak; in the American plant (figs. 16–18) there is no beak, the orifice occupying a slight depression in the broadly rounded summit. The very short but definite beak in true *C. pallescens* is shown in Host, Gram. Austr. i. t. 74, fig. 5 (1801)—our fig. 13; and in Boott's Illlustrations of the Genus Carex, iv. t. 450 (1867), figs. *a* and *b*, at right (our fig. 14), Boott's description on p. 139 saying "perigyniis . . . saepe brevissimo abrupte rostellatis", although on the next page (presumably through inclusion of the American plant) he reversed himself and said "*Perigynium* . . . saepe erostellatum". The beak is also displayed in Reichenbach, Ic. Fl. Germ. Helv. viii. t. ccli. fig. 617; and in numerous other Old World illustrations. The perigynium of the American var. *neogaea* has had no good illustration, except for

the tiny one of the late Schuyler Mathews in Gray, Man. ed. 7, fig. 238 (1908). It has been many times accurately described: "Very obtuse . . . ; the orifice minute and entire"—Torr. Fl. N. Y. ii. 403 (1843); "wholly beakless"—Bailey in Gray, Man. ed. 6: 606 (1889); "well marked by the . . . pointless perigynia"—E. C. Howe in 48th Rep. N. Y. State Mus. 102—Repr. 64 (1896); "abruptly rounded and beakless at apex"—Mackenzie in N. Am. Fl. xviii[6]. 320 (1935). These authors had the American, not the European, plant before them; although Mackenzie cited in the synonymy of the American plant 28 names and combinations, 27 of them belonging exclusively to Old World variations not known in America, the 28th an American misapplication of the European *C. undulata* Kunze.

As to *Carex undulata* Kunze, Suppl. Riedgr. 23, t. 4, fig. 2 (1840), which became *C. pallescens*, var. *undulata* (Kunze) Reichenb. Ic. Fl. Germ. viii. 22, t. 251, fig. 618 (1846) and which was separately taken up as var. *undulata* (Kunze) Carey in Gray, Man. 552 (1848), although Reichenbach's characterization of it as "a praecedente fructu obtusiore" suggests var. *neogaea*, the original illustration of the inflorescence and the perigynium by Kunze (our FIG. 19) shows by the tapering summit that it is not ours.

In PLATE 712, FIGS. 13–16 are of CAREX PALLESCENS L. of Europe; FIG. 13, a perigynium, × 10, from Moravia, *Domin & Krajina*, Fl. Čechos. Exsicc., no. 354; FIG. 14, perigynium, after Host; FIG. 15, perigynia after Boott. FIG. 19 is the inflorescence and a perigynium (*g*) from the original plate of *C. undulata* Kunze. FIGS. 16–18 are perigynia, × 10, of var. *neogaea:* FIG. 16, from the TYPE; FIG. 17, from Grand Manan, New Brunswick, *Weatherby*, no. 5635, with persistent style projecting from orifice; FIG. 18, from Newcomb, New York, *House*, no. 7426.

CAREX DEBILIS Michx., var. **intercursa,** var. nov. (TAB. 713, FIG. 6), a var. *typica* differt perigyniis puberulis opacis, a var. *pubera* differt squamae foemineae carina non exserta. Southeastern Virginia and eastern North Carolina. VIRGINIA: Richmond, May 9, 1894, *J. R. Churchill;* argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, Greensville County, June 13, 1940, *Fernald & Long*, no. 12,016 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). NORTH CAROLINA: moist open woodland, Lake Raleigh, 3 miles south of Raleigh, April 23, 1938, *Godfrey*, no. 3706; creek-bank, Delgado, near Wilmington, April 21, 1923, *J. R. Churchill.*

Carex debilis, var. *intercursa* is exactly intermediate between typical *C. debilis*, with glabrous and lustrous perigynia, and var. *pubera* Gray, Man. ed. 5: 593 (1867). It has the puberulent and opaque perigynia of the latter, the pistillate scales of the former. In typical *C. debilis* the obtuse to acute scales (fig. 1) usually (but not always) have the midrib evanescent toward the tip, so that the tip of the scale is commonly veinless; in var. *pubera* the midrib reaches the tip of the scale (fig. 5) or projects as a short cusp or awn. Otherwise the only difference I am able to detect is the puberulent perigynium of var. *pubera*, a character quite variable in its intensity. Both of Judge Churchill's collections of var. *intercursa* (from Richmond and from Wilmington) and Godfrey's from Lake Raleigh were, quite naturally, distributed as var. *pubera*, while, at the time of collecting our no. 12,016, Mr. Long questioned if it might be var. *pubera*. All these plants of the Coastal Plain and the outer Piedmont have, however, the most extreme scale of *C. debilis* and they seem to be another of the numerous geographic varieties of that highly variable species.

It is most probable that var. *intercursa* is the *Carex venusta*, var. β. of Boott, Ill. Carex, i. 51 (1858), which Mackenzie includes in the synonymy of his *C. allegheniensis* (based, as to type, on *C. debilis*, var. *pubera* Gray). Boott gave no locality for his *C. venusta*, var. β. except "New [North] Carolina, *Mr. Curtis*". It differed from the coarser *C. venusta* (which has puberulent perigynia) in its more slender spikes with more slender perigynia and "squama lanceolata obtusa vel acuta, infima acuminata albida". That could have been either var. *pubera* or var. *intercursa;* without examining Boott's material we can only guess. Curtis collected extensively about Wilmington, where var. *intercursa* occurs, and published a list of the plants of the region; but he lived at Hillsboro in Orange County, where var. *pubera* possibly occurs.

It is somewhat disconcerting to one who has many times collected typical *Carex debilis* to read in Mackenzie's treatment in the North American Flora that it grows in "Dry woods and copses", while var. *pubera* (*C. allegheniensis*) occurs in "Dry woodlands, mostly in the mountains, Pennsylvania to North Carolina". There are only a few sheets in the Gray Herbarium

on which the habitat of var. *pubera* is indicated. These, however, suggest anything but dry woods and none are from the Alleghenies. The type was collected by Porter at Bear Meadows, Center County, Pennsylvania. Bear Meadows, Professor Herbert A. Wahl informs me, is a peat bog in southern Center County, so near the northwestern corner of Huntingdon County that old specimens may have come from either county. Professor Wahl also informs me that he has thus far been unable to locate Porter's type-station. Bear Meadows is considerably to the east of the true Allegheny Mountains. The labels in the Gray Herbarium showing the habitat of var. *pubera* (*C. allegheniensis*) are as follows: "In swamp", Takoma Park, D. C., *Painter*, no. 105 (at inner edge of Coastal Plain); "boggy meadow", Augusta Co., Virginia, *Carr*, no. 423 (separated from the Alleghenies by the Shenandoah Range); "moist ground and copses", Biltmore, North Carolina, *Biltm. Herb.* no. 205b (no part of the Alleghenies in North Carolina!); "wet slope" Tallulah Falls, Georgia, *Perry & Strahan*, no. 784 (Blue Ridge). The latter and two other collections from Georgia (Savannah, herb. Dewey; Warm Springs, *Tracy*, no. 8976) indicate that var. *pubera* extends considerably south of Mackenzie's southern limit, North Carolina. Other specimens in the Gray Herbarium, although without indication of habitat, are from well to the east of the Alleghenies: Bedford County, Virginia (eastern edge of Blue Ridge) and Raleigh, North Carolina (outer Piedmont, merging to Coastal Plain).

As to the occurrence of typical *Carex debilis* in "Dry woods", all labels in the Gray Herbarium giving habitats have been checked. The result follows: alluvial bottomland, 3; bed of dried-up stream, 2; border of pond or creek, 8; edge of woods, 1; low woods (including collection by *Mackenzie*), 4; swamps, 1; swampy woods or thicket, 8; wet roadside, 1; wet woods, 3.

Since the varieties of *Carex debilis* are not too well understood I am showing in Plate 713 characteristic portions of pistillate spikes ($\times$ 5) of the varieties I recognize.

My understanding of this complex species is summarized below.

a. Perigynia glabrous and lustrous; scales rarely cuspidate. . . . *b.*
b. Perigynia mostly overlapping, obscurely angled; pistillate spikes 1.5–6 cm. long; midribs of pistillate scales usually evanescent at tip.
Scales whitish; perigynia 6–9(–10) mm. long. . . . . Var. *typica.*
Scales stramineous to pale brown; perigynia 4.5–7 mm. long.
Basal leaves 2–4 mm. broad, relatively thin; spikes loosely spreading to pendulous; perigynia stramineous to rusty, twice as long as scales. . . . . Var. *Rudgei.*
Basal leaves 4–7 mm. broad, subcoriaceous; spikes stiffer, simply spreading to erect; perigynia greener, barely one third longer than scales. . . . . Var. *strictior.*
b. Perigynia mostly remotely alternate and not overlapping, firmer and more definitely trigonous; spikes 4–8 cm. long; midribs of pistillate scales sometimes excurrent; basal leaves subcoriaceous, 4–7 mm. broad. . . . . Var. *interjecta.*
a. Perigynia minutely puberulent, often more nerved, 5–9 mm. long.
Midrib of pistillate scales extending to tip or excurrent . . . . . Var. *pubera.*
Midrib evanescent below tip of scale. . . . . Var. *intercursa.*

C. DEBILIS Michx., var. **typica.** *C. debilis* Michx. Fl. Bor. Am. ii. 172 (1803). *C. debilis*, var. *prolixa* Bailey in Proc. Am. Acad. xxii. 105 (1886).—Low woods, thickets, swamps and clearings, Florida to Texas, north to southeastern Massachusetts, Long Island, New Jersey, Pennsylvania, Kentucky, southern Indiana and Arkansas. PLATE 713, FIG. 1.

Var. RUDGEI Bailey in Mem. Torr. Bot. Cl. i. 34 (1889). *C. tenuis* Rudge in Trans. Linn. Soc. vii. 97, pl. 9, fig. 2 (1804). *C. flexuosa* Muhl. ex Willd. Sp. Pl. iv. 297 (1805).—Open woods, thickets and meadows, Newfoundland to Ontario and Wisconsin, south to Nova Scotia, New England, Long Island, North Carolina, Tennessee and Missouri. FIG. 2.

Var. STRICTIOR Bailey in Mem. Torr. Bot. Cl. i. 34 (1889). *C. tenuis*, var. *erectior* Britton in Britt. & Brown, Ill. Fl. i. 321 (1896).—Upland woods, mostly at high altitudes (up to 1600 m.), central Maine to Vermont and Massachusetts. FIG. 3.

Var. INTERJECTA Bailey in Bull. Torr. Bot. Cl. xx. 418 (1893). *C. tenuis*, var. *interjecta* (Bailey) Britton in Britt. & Brown, Ill. Fl. i. 320 (1896).—Mostly in upland woods and clearings, mts. of N. H. to southern Michigan, south to western Connecticut, northern New Jersey, Pennsylvania and mts. of Tennessee. FIG. 4.

Var. PUBERA Gray, Man. ed. 5: 593 (1867). *C. allegheniensis* Mackenzie in N. Am. Fl. xviii[5]. 291 (1935).—Low woods and meadows, central and eastern Pennsylvania, south to Georgia, mostly east of the Alleghenies. FIG. 5.

Var. INTERCURSA Fernald, supra.—Low woods, thickets, clearings and shores, southeastern Virginia and eastern North Carolina. FIG. 6.

In PLATE 713 the photographs of portions of pistillate spikes are mostly × 5. FIG. 1 is of CAREX DEBILIS Michx., var. TYPICA from east of Surry Courthouse, Virginia, *Fernald & Long*, no. 9883; FIG. 2, var. RUDGEI Bailey, from Yarmouth, Nova Scotia, *Bissell & Long*, no. 20,513; FIG. 3, var. STRICTIOR Bailey, × 1 from Mt. Lafayette, New Hampshire, July 29, 1863, *Wm. Boott;* FIG. 4, var. INTERJECTA Bailey, from Lincoln, New Hampshire, *Fernald*, no. 11,623; FIG. 5, var. PUBERA Gray, from Augusta Co., Virginia, *Carr*, no. 423; FIG. 6, var. INTERCURSA, from the TYPE.

CAREX AMPHIBOLA Steud., var. **rigida** (Bailey), comb. nov. *C. grisea*, var. (?) *rigida* Bailey in Mem. Torr. Bot. Cl. i. 56 (1889).

C. AMPHIBOLA, var. **turgida,** var. nov., perigyniis oblongo-subcylindricis turgidis 4–5.5 mm. longis 1.7–2.5 mm. latis apice subrotundatis basi rotundatis; foliis (3–) 4.5–10 mm. latis.—*C. grisea* sensu Boott, Ill. Carex, i. 34, t. 86 (1858).—Rich woods, bottomlands and swales, chiefly calcareous, western New Brunswick to southern Ontario and Minnesota, south to Massachusetts, Connecticut, Georgia, Alabama, Louisiana and eastern Texas. TYPE: open alluvial and marshy flats between Fall Creek, East Hill and Cayuga Lake, Ithaca, New York, June 15, 1914, *Wiegand & Thomas*, no. 1915 (in Herb. Gray.).

After several days of detailed study and checking of characters I am forced to consider *Carex amphibola* Steud., *C. grisea* sensu Boott and all later authors and *C. bulbostylis* Mackenzie (*C. amphibola*, var. *globosa* (Bailey) Bailey in Contrib. U. S. Nat. Herb. ii. 480 (1894), based on *C. grisea*, var. *globosa* Bailey in Gray, Man. ed. 6: 605 (1890)), one intergrading series of varieties.

There is even a grave doubt as to the exact identity of *C. amphibola*, for Steudel had mixed material. When he examined Steudel's plants, L. H. Bailey recorded "*C. amphibola* [p.] 234: *C. grisea*, var. *angustifolia*, Boott."—Bailey in Mem. Torr. Bot. Cl. i. 69 (1889). Boott's var. *angustifolia* is the southern plant with narrow leaves (mostly 1.5–4 mm. wide), relatively tight and slightly beaked, brown perigynia somewhat tapering at base and 4–4.7 mm. long by 1.4–2 mm. broad, the basal sheaths reddish-purple ("vaginis infimis foliorum purpureis"). Steudel's description was certainly of a mixture. His "culmo . . . compresso-triquetro" suggests some member of § *Laxiflorae*, that section being characterized by the easily compressed or even wing-angled soft and soon wilting culms, whereas the plant passing as *C. amphibola* has firm or almost wiry persistent culms not compressed. Steudel's "foliis . . . vix scabriusculis" is, likewise, not good for a plant (*C. amphibola*, sensu authors) with leaves scabrous on the margins and nerves. Mackenzie notes

in North American Flora, xviii[5]. 269 (1935) that "*Drummond* 437 [basis of *C. amphibola*] in the New York Botanical Garden is *Carex blanda* Dewey, and C. B. Clarke in his copy of Steudel has so marked *C. amphibola*". In deference to Bailey's identification of Steudel's own material I am temporarily retaining the name *C. amphibola*, with the hope that I may yet have an opportunity personally to see Steudel's material.

When we consider the name *Carex grisea* Wahlenberg in Svensk. Vet.-Akad. Nya Handl. xxiv. 154 (1803) there seems to be little question that he had some member of the § *Laxiflorae*. The very name *grisea* is inappropriate for the plant to which it has been generally applied. Bailey included *C. grisea* among "Wahlenberg's originals [which] do not appear to be in existence" —Mem. Torr. Bot. Cl. i. 60, 61 (1889); but it is not clear what Bailey was referring to when he went on, "The figures in Schkuhr with which Wahlenberg compares his *C. grisea* . . . are unmistakable", for Bailey did not state where Wahlenberg made such a comparison and Wahlenberg, in publishing his *C. grisea* in 1803, made no mention of Schkuhr and no comparison with any species. Furthermore, the only figures of Schkuhr's which belong with *C. grisea* sensu Bailey were published in 1806 in Schkuhr. Riedgr. Nachtrag. 69, t. K k k, fig. 141 (1806), and were said (erroneously) to be of *C. laxiflora* Lam. In fact, when Francis Boott took up the name *C. grisea* in the sense of *C. amphibola*, var. *turgida* his discussion of it was chiefly a demonstration that it could not be *C. laxiflora* Lam. Here is Wahlenberg's whole account:

> 85. *C. grisea:* spicis exserte pedunculatis sexfloris sparsifloris, bracteis vaginantibus longissime foliatis remotissimis squamis cuspidatis, capsulis oblongo-ovalibus triquetris acutiusculis ore integerrimo. Patria ignota est, an America borealis? In herbario *Swartzii* asservatur.

Just how Boott, Ill. Carex, i. 34, t. 86 (1858), came to the conclusion that Wahlenberg's *Carex grisea* was the plant described and illustrated by himself is not clear. Wahlenberg said "spikes on exserted peduncles, remotely 6-flowered"; Boott said (correctly) "spicis . . . foemineis . . . sub-9-vel 4–13-floris remotis vel superioribus 2 contiguis sessilibus vel inserte vaginatis" and again "Spicae . . . subdensiflorae". Boott's correct description of a plant with dense mostly sessile or short-

peduncled spikes up to 13-flowered and his plate showing 14 strongly imbricated perigynia on one half of a spike is not very suggestive of Wahlenberg's "spicis exsertis pedunculatis sexfloris sparsifloris". Neither does Boott's accurate account of the perigynium of *C.* "*grisea*" sensu Boott, "perigyniis oblongis utrinque obtusis subturgidis obtuse trigonis" or Mackenzie's "perigynia oblong-obovoid, suborbicular and slightly triangular in cross-section . . . rounded at base and apex, beakless" seem well satisfied by Wahlenberg's "capsulis oblongo-ovalibus triquetris acutiusculis". As already stated, Wahlenberg's account suggests some member of the § *Laxiflorae*, several of which are griseous and have long-exserted peduncles, 6-flowered spikes, with remote trigonous and pointed perigynia. Incidentally, the source of *C. grisea* was unknown. Until the actual type of *C. grisea* is found the name should be dropped as too doubtful.

As for the intergradation of the varieties of *Carex amphibola*, Mackenzie emphasizes the "Culms strongly purple-tinged at base" as absolute and forthwith includes in the synonymy *C. grisea*, var. (?) *rigida* Bailey. Var. *rigida*, said by its author to be "A singular plant, which I do not understand", was not understood by Mackenzie. As originally defined it was based on material from Sellersville, Pennsylvania, Faulkland, Delaware, and "Florida, *Chapman*", the Chapman plant "least characteristic of the three". The Sellersville specimen, originally called *C. oligocarpa*, bears the annotation by Bailey "This specimen appears to be intermediate bet. *oligocarpa* and *grisea*. It may be a stiff and broad-leaved *grisea* var. *angustifolia*". It is coarser and with broader and firmer leaves than in true *C. amphibola* and the purple in the base is pretty brown. The Faulkland material is similar to it and with brown lower sheaths, with the merest suggestion of purple at the very base (if properly turned to catch the light). The Chapman material is very similar, with too coarse and too brown-based tufts and too stiff and broad (up to 6 mm. wide) leaves for true *C. amphibola*.

C. amphibola has very slender and definitely purple bases, with relatively thin leaves only 1.5–4 mm. wide. Its close brownish perigynia taper to either end and are more definitely obtuse-angled than in the broader-ranging var. *turgida*, 4–4.7 mm. long by 1.4–2 mm. broad. It is represented in the Gray Herbarium by the following numbered specimens.

Virginia: Claremont Wharf, Surry County, *Fernald & Long*, no. 9874; Carey Bridge, Southampton County, *Fernald & Long*, nos. 11,783, 11,789, 11,790 and 12,005; Courtland, Southampton County, *Fernald & Long*, no. 11,792; Emporia, Greensville County, *Fernald & Long*, no. 11,795. Florida: St. Marks River, Wakulla County, *Harper*, no. 60; Hampton Springs, Taylor County, *Harper*, no. 63; Tallahassee, Leon County, *Harper*, no. 65; River Junction, *A. H. Curtiss*, no. 6401. Tennessee: Clarksville, Montgomery County, *E. J. Palmer*, no. 17,586 (as *C. digitalis*). Arkansas: Fulton, *Bush*, no. 1351. Louisiana: *Hale*. Texas: Houston, *E. Hall*, no. 742.

Var. *rigida* is coarser than true *C. amphibola*, with brown bases, rarely tinged with purple, the stiffer leaves 3–6 mm. broad, the perigynia nearly as in true *C. amphibola* or slightly larger and verging on the less inflated ones of var. *turgida*. It is commoner southeastward than true *C. amphibola* and intrudes much more upon the area of var. *turgida*. To me it is a transitional series between the two extremes. Its somewhat nondescript nature is shown by Mackenzie's marking many sheets of it "*C. amphibola*", many quite similar sheets "*C. grisea*", the latter, presumably, because he noted the "Culms brownish-tinged at base". The following, from among many sheets of specimens, I refer to var. *rigida*.

Massachusetts: Sheffield, Berkshire County, July 5, 1920, *Churchill*. Connecticut: Southington, *L. Andrews*, no. 656, *Bissell*, no. 25; New Haven, 1859, *D. C. Eaton*. New York: College Point, Queens County, June 9, 1908, *Harper;* Cayuga Heights, Ithaca, *Wiegand*, no. 6072. New Jersey: Harbourton, Mercer County, *Benner*, no. 5633; Garden Lake, *Long*, no. 16,162. Pennsylvania: Easton, June 4, 1887, *Porter;* Milford Square, Bucks County, May 27, 1922, *Fretz;* Lanape, Chester County, *Painter & Hodson*, no. 624; Sellersville, 1884, *Fretz*, (type or isotype). Delaware: Wilmington, *E. Tatnall;* Faulkland, June 7, 1884, *Commons* (paratype). Maryland: Patuxent, Anne Arundel County, *Painter*, no. 1402; Cropley, Montgomery County, *Blake*, no. 10,839. District of Columbia: Glen Echo, *C. F. Wheeler*, no. 827. Virginia: Bull Run Mountains, Fauquier County, *Allard*, nos. 4713 and 4786; Big Cobbler Mountain, *Allard*, no. 7771; Indian Point, Prince George County, *Fernald & Long*, nos. 11,786 (slightly purple tone in base, but leaves up to 6 mm. wide); Claremont, *Fernald & Long*, no. 11,793; Haley's Bridge, Southampton County, *Fernald & Long*, no. 7782; north of Orion, Greensville County, *Fernald & Long*, no. 12,007. North Carolina: Biltmore, *Biltmore Herb.* no. 5754a; south of

Durham, *Godfrey*, no. 3832; Raleigh, May, 1897, *Ashe;* Wilmington, April 21, 1923, *Churchill.* South Carolina: west of Myrtle Beach, *Weatherby & Griscom*, no. 16,426, Florida: without stated locality, *Chapman* (paratype); Jacksonville, *A. H. Curtiss*, no. 6356; Hampton Springs, Taylor County, *Harper*, no. 62. Indiana: Henryville, Clark County, *Hermann*, no. 6747; New Middletown, Harrison County, *Deam*, no. 27,655. Tennessee: Jackson, *Bain*, no. 253; Nashville, *Gattinger*. Mississippi: Starkville, May 29, 1891, *Tracy.* Illinois: Bird Haven, Richland County, *Ridgway*, no. 872. Missouri: Ironton, May 24, 1918, *Churchill*, Butler County, *Bush*, no. 2660. Texas: southwest of Lufkin, Angelina County, *Cory*, no. 7922. Some originally called *C. grisea*, others *C. amphibola*, the identifications variously altered, mostly to *C. amphibola*, by Mackenzie.

Many specimens quite intermediate between *C. amphibola* vars. *rigida* and *turgida* are in the collections from Kentucky and Tennessee.

The Identity of Carex laxiflora (Plate 714).—So far as I can find the material upon which Lamarck based his *Carex laxiflora* has not been adequately discussed. The name has been hopelessly misapplied—to several different plants of § *Laxiflorae* as well as to members of other sections; and in two recent studies it has been used in quite dissimilar senses. Wiegand, Rhodora, xxvi. 195 (1922), took it up for *C. gracilescens* Steud. with "pistillate spikes . . . 7–25 mm. long . . . perigynia usually crowded . . . apex tapering but scarcely beaked, usually strongly bent or recurved". He seems not to have studied Lamarck's original material; if he had he would have found it closely agreeing with that author's diagnosis and fuller account of his specimens. Lamarck quite appropriately called his species *C. laxiflora*, from the very slender and remotely flowered pistillate spikes of the more mature individuals before him. His account was as follows:

50. Laiche à fleurs lâches, *Carex laxiflora, Carex spicis foemineis filiformibus axillaribus erectis, flosculis distantibus, foliis planis.* N[obis]. Ses tiges viennent en touffe, sont feuillées, & s'élèvent à la hauteur de sept à neuf pouces. Ses feuilles sont alternes, droites, graminées, planes comme celles du *Juncus pilosus*, glabres, larges de deux lignes & demie à trois lignes; les inférieures ou radicales sont plus courtes que les autres. L'épi mâle est terminal, droit, pâle ou jaunâtre, à peine long d'un pouce; il est embriqué d'écailles ovales-lancéolées, membraneuses. Les épis femelles, au nombre de trois, sont alternes, axillaires, droits, filiformes, pédonculés, longs d'un pouce; ils sont garnis de fleurs alternes, distantes, blanchâtres, à écailles mucronées & membraneuses.

Ces épis sont moins longs que les feuilles qui les accompagnent. Cette espèce bien distincte croît dans le New-York, la Pensylvanie & la Virginie. (*v. s.*)—Lam. Encycl. iii. 392 (1789).

Although Lamarck optimistically spoke of "this very distinct species", his material, preserved at the Muséum Nationale d'Histoire Naturelle at Paris and scarcely or barely in flower, really represents two species. In the autumn of 1934 Mr. Ludlow Griscom most kindly brought me, after his visit to Paris, photographs of the two sheets now extant of Lamarck's original specimens. One (FIGS. 1–4) is from New York, the other (FIGS. 5–7) from Virginia. They are mere culms broken off from the crown: the New York plant (FIG. 1) with a tuft of two culms, both far enough developed to show the loosened pistillate spikes; and a separate flowering culm quite like the other two. The Virginia plant (FIG. 5) is represented by a single culm barely in flower. The small ticket (FIG. 2) bearing in Lamarck's hand the name "*Carex laxiflora* Lam. dict." beside a similar one in his hand "de Virginie" has been pasted, somewhat recently, on the sheet with the latter specimen—somewhat recently, since the normal position for these labels, as shown by many photographs of Lamarck's types, is occupied by a larger label in the hand of L. H. Bailey: "*C. laxiflora* var. *intermedia* of Boott! L. H. Bailey Nov. 22, 1888". Lamarck's little labels were apparently originally loose and not attached by Lamarck himself. It was presumably by mere chance that the label marked "*C. laxiflora* Lam. dict." was attached to one sheet rather than to the other. Both the New York and Virginia plants were to Lamarck *C. laxiflora*, as they were to Bailey in 1888. Reporting on the latter, Bailey identified *C. laxiflora* with *C. heterosperma* Wahlenb. (1803) and *C. anceps* Muhl. (1805), saying "Lamarck's specimens, both from Virginia and New York, although young, are unmistakably the plant which Boott made var. *intermedia*, and I therefore revise the species that this form may appear as the type. . . . The type of *C. laxiflora* embraces slender plants, characterized by narrow leaves (usually less than ¼ in. in width), a peduncled or at least very conspicuous staminate spike, scattered pistillate spikes which are very loosely flowered and narrow (½ to 1½ in. long), and very blunt perigynia".—Bailey in Mem. Torr. Bot. Cl. i. 32 (1889).

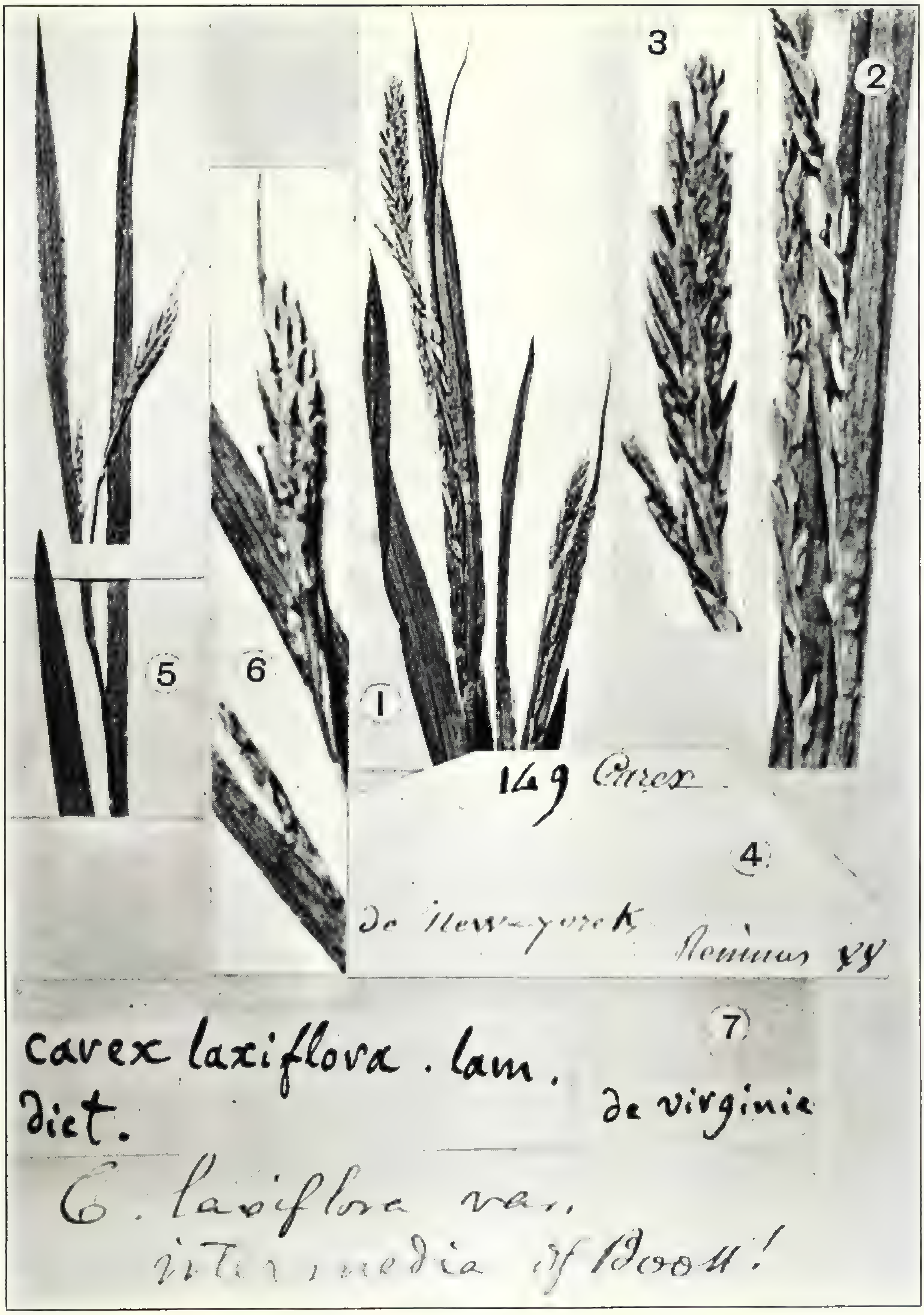

Photo. B. G. Schubert, after Cintract.

Details of Lamarck's sheet of Carex laxiflora (see text).

Photo. B. G. Schubert.

FIGS. 1–4, CAREX INFLATA: FIGS. 1 and 3, spikes × 1; FIGS. 2 and 4, portions of pistillate spikes to show scales, × 4. FIGS. 5 and 6, var. ANTICOSTENSIS: FIG. 5, portion of inflorescence, × 1; FIG. 6, portion of pistillate spike, × 4. FIGS. 7–9, var. AMBIGENS: FIGS. 7 and 8, inflorescences, × 1; FIG. 9, portion of pistillate spike, × 4.

The New York material of Lamarck's is certainly the same as *C. anceps* Muhl., but I see nothing in Boott's plate (Ill. i. t. 91. fig. 1) of his var. *intermedia* in it. The latter is correctly cited by Wiegand under *C. ormostachya* Wieg. in RHODORA, xxiv. 196 (1922). And, by present-day interpretations of typification, it may seem difficult to reconcile Bailey's further discussion of *C. striatula* Michx. or *C. laxiflora*, var. *striatula*, based nomenclaturally upon it. "Var. *striatula* is marked by broad leaves, a very short and inconspicuous sessile staminate spike, very short and thick pistillate spikes (rarely over ½ in. long), the upper ones being sessile about the staminate spike", followed by his description of *C. striatula* Michx. (basis of *C. laxiflora* var. *Michauxii* Bailey, l. c.), "leaves narrow . . . ; staminate spike commonly long-peduncled; pistillate spikes scattered, . . . loosely flowered". *C. striatula* to Bailey was one plant, *C. laxiflora*, var. *striatula*, resting nomenclaturally upon it, another. This interpretation arose from a former practice of divorcing plants described from the names erroneously borrowed from earlier authors for them. When Carey described his *C. laxiflora*, var. *striatula* he described *C. blanda* Dewey, although his varietal name was based on *C. striatula* Michx., which he did not understand.

When the material which Lamarck had before him is studied it is evident that the New York specimens (FIGS. 1–4), with pistillate spikes 3, about an inch (up to 3 cm.) long, filiform, with distant flowers and mucronate scales, the staminate spike pale to yellowish, with oval-lanceolate membranous scales, and the leaves 2½–3 lines (5.2–6.3 mm.) broad, most closely match his description. The Virginia fragment (FIGS. 5–7) has bracteal leaves only 3–3.5 mm. (1.4–1.7 lines) broad, pistillate spikes with imbricated scales, and the scales of the staminate spike white, round-tipped and with the conspicuous green midribs not excurrent as points. The very narrow bracteal leaves, the imbricated pistillate scales and relatively short spike, and the white (chartaceous) staminate scales with rounded tips and with the vivid green midrib not excurrent, are diagnostic characters of *Carex striatula* Michx. (a photograph of Michaux's TYPE before me). The latter southern species was beautifully illustrated, as *C. laxiflora*, by Boott, l. c. t. 89. Although the bracts of

Lamarck's Virginian element of his *C. laxiflora* greatly overtop the staminate spike, whereas in well developed *C. striatula* they are commonly shorter, young flowering culms of the latter have them prolonged, such Virginia material as *Allard*, nos. 325 and 1468, *Baldwin*, no. 194 and *Fernald & Griscom*, no. 4339 (misidentified as *C. anceps*). In several years of intensive exploration in southeastern Virginia Mr. Long and I have only rarely found true *C. laxiflora* (*C. anceps*) there; in woodlands of New York it is abundant. In eastern Virginia *C. striatula* abounds. I, therefore, am forced to the conclusion that Lamarck's New York specimens, more closely matching his characterization, are the TYPE of his *C. laxiflora*, the Virginia material included by him with it being very young *C. striatula* Michx. I wholly concur in Bailey's decision in 1889 that the type of *C. laxiflora* is to be identified with *C. anceps* Muhl., although Bailey confused the decision by including *C. gracilescens* Steud. and some other elements. I thus quite agree with Mackenzie in the North American Flora, in taking up *C. laxiflora* in the sense of *C. anceps*. I cannot follow Wiegand in using the name in the sense of *C. gracilescens*.

In Plate 714, figs. 1–4 are from the New York (TYPE) specimens of Lamarck's Carex laxiflora: fig. 1, summit of larger tuft, × 1; fig. 2, pistillate spikes, × 3; fig. 3, staminate spike, × 3; fig. 4, the label, × 1. Figs. 5–7 are from the young Virginia material included by Lamarck under his *C. laxiflora* (now identified as *C. striatula* Michx.): fig. 5, summit of the specimen, × 1; fig. 6, spikes, × 3; fig. 7, labels, with portion of annotation by L. H. Bailey, × 1.

C. Hostiana in North America.—In Rhodora xiii. 130 (1911) the late Dr. Wiegand and I pointed out that the plant of Newfoundland and Anticosti, which had passed as *C. fulva* Good. or as *C. Hornschuchiana* Hoppe, differed from the European plant in greater size of its parts. We consequently called it *C. Hornschuchiana*, var. *laurentiana*. Subsequently, finding that the latter specific name was antedated by another, we called it *C. Hostiana* DC., var. *laurentiana* Fern. & Wieg. in Rhodora, xxvi. 122 (1924). Mackenzie, however, arguing that, as a strictly North American plant, *C. Hostiana*, var. *laurentiana* should be considered a species, described it as *C. fulvescens* Mackenzie in Bull. Torr. Bot. Cl. xxxvii. 239 (1916). The two differ only in size of parts; they have the same habit and are unique in § *Extensae* in having the upper and ascending bracts

long-sheathing, the other species having the divergent upper bracts sheathless.

Most of the collections made of *C. Hostiana*, var. *laurentiana* are represented in the Gray Herbarium: Newfoundland collections of Fernald & Wiegand or of Fernald, Long and others and of Arsène, Mackenzie & Griscom, and Pease (8 nos.); Anticosti collections of John Macoun and of Victorin et al. (7 nos.). Although Mackenzie makes the perigynia of his *C. fulvescens* "5–6 mm. long", I have carefully studied the 15 numbers of it before me (one of Mackenzie & Griscom's misidentified as *C. lepidocarpa* Tausch, which has the upper bracts sheathless and divergent, instead of long-sheathed and ascending) and can find no perigynia 6 mm. long; they range from 3.5–5 mm. in length, mostly less than 5 mm., while the quite similar but usually smaller European *C. Hostiana* has them about 3 mm. long.

My reason for this note is to record typical *C. Hostiana*, with more slender habit, more slender pistillate spikes and perigynia only 3 mm. long, from Miquelon, collected in June, 1937, by *M. L. Hors* and sent me by Brother Louis-Arsène. The argument that *C. Hostiana* is wholly Eurasian, consequently that the Newfoundland plant, although differing from it only by an easily bridged gap in measurement of the perigynia, must be treated as a distinct species, loses its force. Both typical *C. Hostiana* and var. *laurentiana* occur along the streams and in the meadows of St. Pierre et Miquelon.

C. LACUSTRIS WEST OF THE ROCKY MOUNTAINS.—In the North American Flora, xviii[4]. 437 (1935) Mackenzie rejected from consideration the old collection of *Carex lacustris* Willd. (*C. riparia* sensu Am. auth., not W. Curtis) from Pend d'Oreille River, made by *Dr. David Lyall* on the Oregon Boundary Survey in 1861, with the following note:

"NOTE 2: An Idaho record for this species is based on an old specimen (*Lyall* in 1861, Fort Coville to Rocky Mountains) labeled as collected at Pend d'Oreille River, Idaho. This specimen was distributed from Kew and is preserved in the Gray Herbarium. This is so far out of the present known range of this species that the record is being treated as a matter of mislabeling."

Had Mackenzie taken pains to look up Dr. Lyall's report[1] he

[1] *Account of the Botanical Collections made by* DAVID LYALL, M.D., R.N., F.L.S., *Surgeon and Naturalist to the North American Boundary Commission.* Journ. Linn. Soc., vii. 124–144 (1864).

would have found no justification for "the record being treated as a matter of mislabeling." Here are Lyall's words: "my later and more extensive collections [the whole series collected from 1858–1861, the plants of 1861 certainly being "later collections"] . . . were retained intact . . . The necessary arrangements having been made which enabled me to repair to Kew, I immediately commenced the sorting and ticketing of the specimens in all the collections . . . The collections having been accurately . . . named, and a complete set laid into the Hookerian Herbarium, I distributed the duplicates to various public museums and botanists in Europe and North America . . .—those having been selected in which . . . they would be most beneficial to science. In doing this, I attached to every specimen a ticket, bearing the same name, locality, &c., as that attached to the specimens retained in the Herbarium at Kew". The first set of duplicates, personally labelled by Lyall, went to "Dr. Asa Gray, Cambridge University, Massachusetts", this the only set sent to America. There seems to be no reason to doubt Lyall's own label, with the name and locality in his own hand, "*Carex riparia* (*lacustris*) Pend Oreille River". The sheet bears the validation by Francis Boott of its identity, and an annotation of the same identification by Mackenzie. One of Lyall's sets was also sent to Berlin. This enabled Kükenthal, treating *Carex* in Engler's Pflanzenreich, to cite *C. lacustris* (as *C. riparia*, var. *lacustris*) as growing in "Idaho". Surely, if the set sent to Berlin also has *C. lacustris* from Pend d'Oreille River, just as do the sheets at Kew and at the Gray Herbarium, the possibility of mislabeling vanishes.

The occurrence west of the Rocky Mountains of species otherwise known only in the eastern States and eastern Canada is one of the most familiar phenomena of geographic distribution in temperate North America; while the occurrence in eastern North America of limited colonies of species predominantly of the Pacific Slope has been so much discussed that to those who see outside the limits of single genera the phenomenon should by this time be quite familiar. The number of species with such bicentric ranges runs into hundreds. In fact, Mackenzie himself admits such bicentric ranges in *Carex: C. tincta* Fernald, "Specimens examined from New Brunswick, Quebec, Maine,

New Hampshire, Vermont, western Massachusetts, western Connecticut, Alberta", with a continuous range unjustifiably implied in "New Brunswick and Maine to Alberta", to which Washington may be added; *C. projecta* Mackenz. with an unsupported continuous range implied in "Newfoundland to British Columbia" but the most western specimens seen only from "Manitoba, Minnesota, Iowa, British Columbia"; *C. abdita* Bickn. (*C. umbellata* sensu Mackenzie, not Schkuhr), with the stated continuous range "Newfoundland to British Columbia" unjustified by the cited western material: "Minnesota, Keewatin, Saskatchewan, British Columbia (Vancouver Island)"; and *C. comosa* Boott, with the bicentric range definitely recognized in "Quebec to Minnesota, and southward . . ; . . . San Francisco Bay to Washington, and eastward . . . to Idaho".

It would be unwise for one who knows the Pend d'Oreille River only from maps to suggest where Lyall collected *Carex lacustris*. Perusal, with Dr. Hugh M. Raup, of Lyall's account indicates that he crossed the river in 1861 near Albany Falls in Bonner County, Idaho, perhaps slightly farther west, in Stevens County, Washington. Search along the river should reveal it, probably in both Idaho and Washington.

Incidentally, although Mackenzie's key and description call for perigynia of *Carex lacustris* with "Teeth of . . . beak short, 0.5 mm. long", as contrasted with other species having the teeth "0.5–3 mm. long", great care should be exercised in following his measurements. Specimens of *C. lacustris* show the teeth to range from 0.3 to 1 mm. in length!

C. INTUMESCENS Rudge, var. FERNALDII Bailey, forma **ventriosa,** f. nov. (PL. 713, FIG. 19–21), perigyniis ovoideis ventriosis 5–8 mm. diametro; achenio trigono-obovoideo apice rotundato.—Newfoundland to Minnesota, south to Nova Scotia, Maine, Massachusetts, Connecticut, New York, West Virginia and mts. of North Carolina. TYPE: Ripton, Vermont, July 19, 1898, *Ezra Brainerd* (in Herb. Gray.).

Carex intumescens at the northern limit of its range has the achene (FIGS. 13–21) obovoid, broadest near the summit and gradually to broadly rounded to the beak, whereas all material from the southern two thirds of the broad specific range has achenes more narrowly ellipsoid, broadest near the middle and gradually tapering to the beak. The latter is true *C. intumescens*,

described by Rudge from Carolina with "semina ovata, triquetra, glabra, acuminata." Examination of achenes of all specimens in the Gray Herbarium gives the following geographic contrast. True *C. intumescens*, with ellipsoid, acuminate achenes (figs. 7–12) is the only one there represented from Florida, Alabama, Mississippi, Louisiana, Texas, Georgia, South Carolina, eastern and Piedmont North Carolina, Virginia, Maryland, Delaware and New Jersey. On the other hand, the plants with obovoid achenes more gradually rounded at summit (var. *Fernaldii*, including forma *ventriosa*) are the only ones represented from Newfoundland, Saguenay County and the Gaspé Peninsula, Quebec, New Brunswick, Prince Edward Island, northern Maine, northern New Hampshire, high mountains of North Carolina, Minnesota and Manitoba. In the intermediate belt both types of achenes are found: in southwestern Quebec, 1 of true *C. intumescens*, 14 of var. *Fernaldii;* Nova Scotia, 5 against 12; southern Maine, 2 to 12; southern New Hampshire 1 to 10; Vermont, 2 to 4; Massachusetts, 10 to 6; Connecticut, 6 to 3; New York 13 to 11; Pennsylvania, 8 to 1; southern Ontario, 3 to 4; Michigan, 5 to 5; Wisconsin, 2 to 4.

That the two forms of achenes belong to geographically largely segregated varieties is clear. Typical var. *Fernaldii* has the perigynia lanceolate and barely inflated, 3–4 (–5) mm. thick (figs. 13, 14 and 17). Forma *ventriosa* in its distended ovoid perigynia closely resembles typical *C. intumescens* but its achenes (fig. 21) are those of the northern var. *Fernaldii*.

In Plate 713, figs. 7–12 are of typical Carex intumescens Rudge: fig. 7, a pistillate spike, × 1, from west of Fairfield, Hyde County, North Carolina, *Godfrey & Kerr*, no. 3855; fig. 8, achene, × 2, from no. 3855; fig. 9, perigynium, × 2, from north of Hoffman, Richmond County, North Carolina, *Wiegand & Manning*, no. 422; fig. 10, achene, × 2, from no. 422; fig. 11, perigynium, × 2, from Auburn, Lee County, Alabama, June 29, 1897, *Earle & Baker;* fig. 12, achene, × 2, from Auburn.

Figs. 13–18, var. Fernaldii Bailey: fig. 13, pistillate spike, × 1, from the type; fig. 14, perigynium, × 2, from type; fig. 15, achene, × 2, from type; fig. 16, achene, × 2, from Grand Cascapedia River, Quebec, July 12–15, 1905, *Williams, Collins & Fernald;* fig. 17, perigynium, × 2, from summit of Roan Mountain, North Carolina, 1878, *G. R. Vasey;* fig. 18, achene, × 2, from Roan Mountain.

Figs. 19–21, var. Fernaldii, forma ventriosa, all from type: fig. 19, pistillate spikes, × 1; figs. 20 and 21, perigynium and achene, × 2.

C. Grayii, var. hispidula.—Typical *Carex Grayii* Carey has the perigynium quite glabrous; var. *hispidula* Gray more or less

hispidulous, at least at base, and through half of its broad range it alone has been found, to the exclusion of the glabrous-fruited plant. In the North American Flora, xviii[7]. 464 (1935) Mackenzie reduced it outright, and in Deam, Fl. Ind. 270 (1940) Her-

Range of Carex Grayii (left); of var. hispidula (right).

mann says: "The form known as var. *hispidula* shows no geographic segregation and doubtless does not merit even formal recognition", and he quotes another observer as stating that the same plants in different years change their perigynia from "hispidulous" . . . to "perfectly glabrous".

Familiar with glabrous-fruited *C. Grayii* in certain regions of the Northeastern States or Canada, Mr. Bayard Long and I have been impressed by its replacement on the bottomlands of southeastern Virginia by a plant which, when examined, always shows some hispidity on the fruit. At the northeastern limit of range, in the Ottawa, St. Lawrence and Chaudiere Valleys in Quebec, along Lake Champlain in Vermont, and along the Housatonic Valley in westernmost Massachusetts and adjacent Connecticut only typical *C. Grayii* has been collected. In the warm Connecticut Valley of central Connecticut, where many southern plants extend their northeastern limits, both are found. In view of this obvious difference of range in New England and southwestern Quebec and the failure of the more northern (glabrous-fruited) extreme to appear in the extensive region of calcareous bottoms in southeastern Virginia, I have borrowed all the material in the United States National Herbarium and the New York Botanical Garden, through the great kindness of Drs. Maxon, Gleason and Wittrock; and Mr. Long has checked the specimens at the Philadelphia Academy. These, with the material in the Gray

Herbarium and the herbarium of the New England Botanical Club, have all been entered on two maps (MAP 1, typical *C. Grayii;* MAP 2, var. *hispidula*). Although from the lower Connecticut and the Delaware westward to Wisconsin, Iowa and Missouri both occur, it will be noted that, in the four herbaria thus examined the glabrous-fruited plant predominates at the northern border of the specific range: 36 specimens seen from the western border of New England across New York, northwestern Pennsylvania, southern Ontario, Michigan and Wisconsin, against only 9 of var. *hispidula.* Conversely, var. *hispidula* alone is represented in these herbaria from Maryland, Virginia, North Carolina, Georgia and Alabama and from the Mississippi Embayment and confluent valleys in Mississippi, Arkansas, Missouri, Tennessee, Kentucky, southern Illinois and southernmost Indiana. In fact, the dominance of var. *hispidula* over the glabrous-fruited plant in the southern quarter of Indiana and the greater abundance in the northern third of that state of typical *C. Grayii* is displayed by the Indiana representation in the four large herbaria examined. The species or the variety is there represented from 27 counties: these collections which have been sent out, largely by Dr. Deam, should be fairly representative of the trend in the state. Enumerating the counties represented, beginning at the north and ending at the south, along the lower Ohio and Wabash Rivers, we get the following score, *g* standing for the typical glabrous-fruited plant, *h* for var. *hispidula:* Marshall *g*, Kosciusko *g*, Noble *g*, DeKalb *h*, Allen *h*, White *g*, Miami *g*, Huntington *g*, Wells *g* and *h*, Adams *h*, Jay *h*, Howard *g*, Hamilton *h*, Delaware *g*, Henry *h*, Marion *g* and *h*, Clay *h*, Union *g*, Knox *h*, Daviess *h*, Jackson *h*, Ripley *g*, Washington *h*, Gibson *h*, Posey *h*, Warrick *h*, Floyd *h*. That var. *hispidula* is, in its broad range, more southern than typical *C. Grayii* and that the latter extends farther to the northeast should be apparent. I am, therefore, forced to look upon it as meriting much more that "not . . . even formal recognition". While nomenclaturally *C. Grayii* is the type of the species, phylogenetically var. *hispidula*, less concentrated in the area invaded by Pleistocene ice, is apparently the older of the two.

THE NORTH AMERICAN VARIATIONS OF CAREX INFLATA (PLATES 715 and 716).—As shown by Rendle & Britten in Journ. Bot.

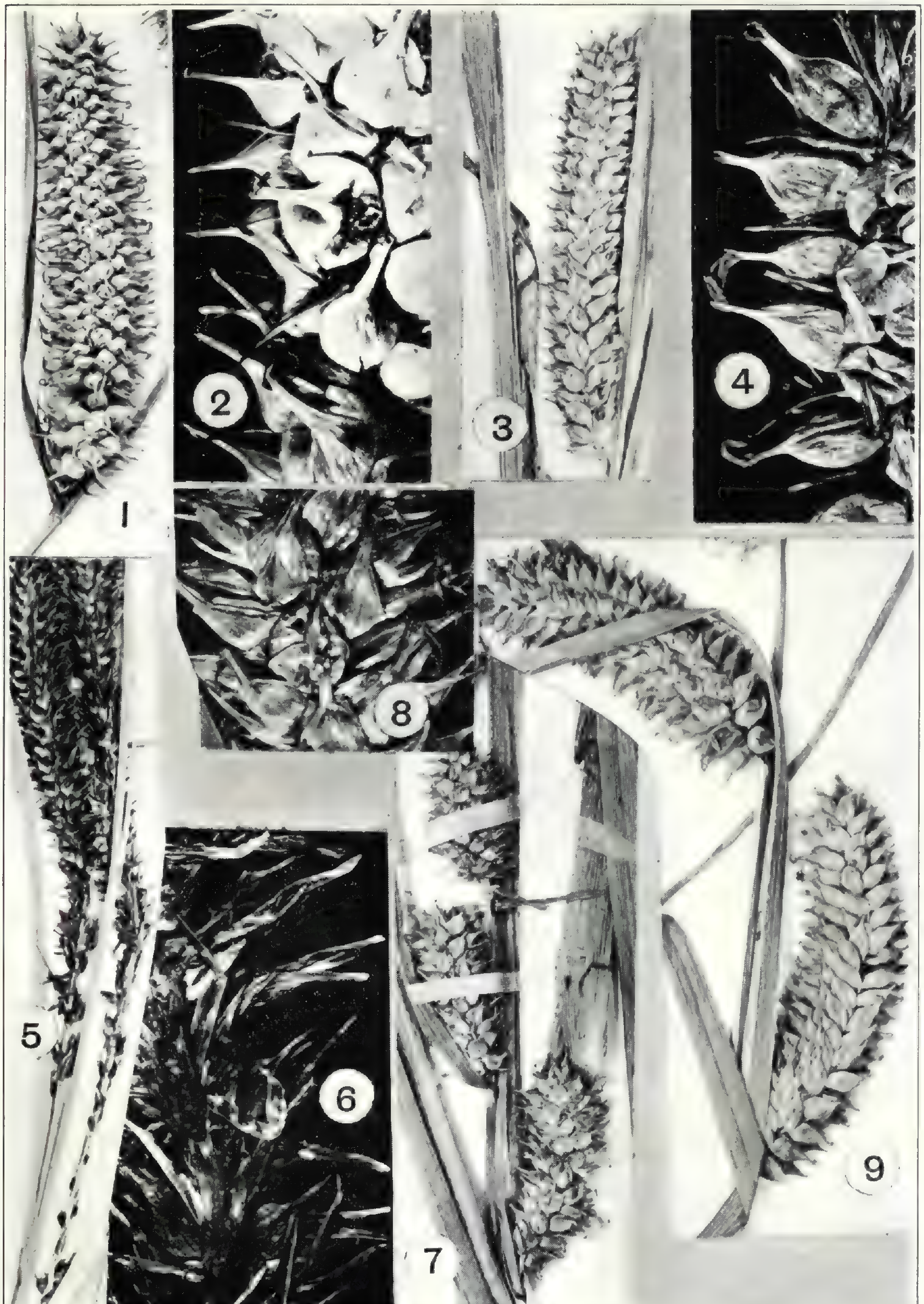

Photo. B. G. Schubert.

Variations of CAREX INFLATA, var. UTRICULATA: pistillate spikes, × 1; enlargements, × 4.

xlv. 444 (1907), *Carex rostrata* Stokes (1787) is antedated by *C. inflata* Hudson, Fl. Angl. 354 (1762) in part, emended in ed. 2: 412 (1778). Although the original (1762) account by Hudson included references to plants of Morison and of Ray which are not conspecific with Hudson's described plant, he emended the account in his second edition (1778), excluding the extraneous references and citing Welsh material which is positively identified with *C. rostrata* (1787). Since the elimination of the extraneous references was effected by Hudson himself and his own description was repeated in the 2nd edition and is supported by a cited specimen which is extant and authoritatively identified, there is no course open but to take up for *C. rostrata* Stokes (1787) the clearly typified *C. inflata* Hudson. This is inconvenient for those who have become familiar with the name *C. rostrata.* It was equally inconvenient when the long-used names *C. utriculata* Boott (1839) and var. *minor* Boott (1839) for the commonest American plant of the group were erroneously replaced by the earlier and chiefly Eurasian *C. rostrata,* or when our commonest American series was misidentified with typical *C. ampullacea* Gooden. (1794).

Very little North American material is satisfactorily identified with true *Carex inflata* (*C. rostrata* Stokes, *C. ampullacea* Gooden.), the 30 fat covers of North American material (fully 750 sheets) in the Gray Herbarium yielding only 29 numbers which can be forced into the typical European form of the species, these all from high-northern, alpine, subalpine or bleak habitats: in Labrador, Newfoundland, eastern Quebec, northern Nova Scotia, northern New Brunswick, northern Vermont, northern Michigan, Lake Athabasca, Mackenzie and Alaska, with a slightly thicker-spiked series, often with broader leaves, at high altitudes to Colorado and California. Otherwise, the great bulk of material from Labrador and Newfoundland to British Columbia, thence south to Delaware, District of Columbia, West Virginia, Ohio, Indiana, Wisconsin, Minnesota, South Dakota, New Mexico and California, differs in essential details from typical *C. inflata.* To be sure, the late K. K. Mackenzie, in a mood of almost unprecedented conservatism, placed all the North American material in undifferentiated "*C. rostrata*", giving as his excuse for so doing: "This is one of the most widely

distributed and most frequently collected of our sedges. Variations in vegetative characters in individual specimens are often marked, but are of no systematic value".—Mackenzie in N. Am. Fl. xviii[17]. 457 (1935).

Typical *Carex inflata* (PL. 715, FIGS. 1 and 2) is 3–6 dm. high, with canaliculate leaves 2–4 mm. broad, pistillate spikes rather lax and 6–8 (rarely –10) mm. thick, with short and blunt or merely acutish scales, the perigynia 3–5 mm. long. The bulk of North American plants are coarser, 0.4–1.2 m. high, with flat leaves 4–12 mm. broad, pistillate spikes denser and 1–2 cm. thick, the prolonged acuminate to aristate scales merely equaling to exceeding the perigynia, the latter 4–10 mm. long. Such plants, to the exclusion of others, occurring over two to three million square miles of temperate North America are not satisfactorily disposed of as "individual specimens". Mackenzie, thus calling everything of the kind (with spongy and obtuse-angled smooth culms and septate-nodulose leaves) simply *C. rostrata*, thus characterizes it: "culms 3–12 dm. high . . . , leaves 2–12 mm. wide, flat . . . ; pistillate spikes 1–1.5 [misprint for 1–15] cm. long, 6–20 mm. wide . . . ; scales long-acuminate, varying to rough-awned or acute . . . ; perigynia . . . 3.5–8 mm. long"—these dimensions apparently taken over, with little change, from Kükenthal's account of *C. rostrata*, var. *utriculata* (the common American plant).

How much more inclusive than the description of true *C. rostrata* of Kükenthal's treatment in Engler, Pflanzen. iv[20]. 720 (1909), a plant recognized by him only from "N o r d und M i t t e l - E u r o p a . . . In S ü d e u r o p a selten und mehr in den Gebirgen . . . A s i e n: T u r k i s c h A r m e n i e n . . . ; L a z i s t a n . . . ; S i b i r i e n, bis zur Lena . . . und Baikalien. W e s t h i m a l a y a . . . Sudwestgrčenland": "Culmus 10–60 cm altus . . . Folia . . . 2–3 mm lata canaliculata . . . Spiculae . . . ♀ cylindricae 3–5 cm. longae 6–8 mm latae . . . Squamae . . . subacutae . . . Utriculi . . . 4–5 mm longi".

By Kükenthal all American material (except from southern Greenland) was put into the inclusive *Carex rostrata*, var. *utriculata* (Boott) Bailey, with "Culms 90–100 cm altus . . . Folia 4–9 mm lata plana. Spiculis . . . ♀ crassiores 1–1½

cm latae. Squamae ♀ magis acuminatae saepe hispido-aristatae. Utriculi 5–8 mm longi"; Kükenthal correctly admitting this dominantly American variety as European and eastern Asiatic as well. His treatment reflects clearer understanding than Mackenzie's. In North America, however, we have two other varieties which seem worth recognition: a plant somewhat resembling the northern European *C. rostrata*, var. *borealis* (Hartm.) Kükenthal in its obsolescent teeth, but coarser, with longer perigynia, known only from Anticosti (PL. 715, FIGS. 5 and 6), and another, as slender as the slenderest *C. vesicaria*, with very short and loose pistillate spikes and slender-tipped or awned and prolonged scales, *C. rostrata*, var. *ambigens* Fernald (PL. 715, FIGS. 7–9).

It is significant, in view of the scarcity with us of true *Carex inflata* (*C. rostrata*, *C. ampullacea*), that Francis Boott, ultra-conservative and remarkably accurate, should have seen in the common American plant a distinct species. In Hooker's Fl. Bor.-Am. ii. 221 (1839), recognizing true *C. inflata* or *C. rostrata* (as *C. ampullacea*), Boott cited material only from extreme northwestern Canada. Immediately following it he described as strictly North American his *C. utriculata* (our PL. 716): 6–9 dm. (bitripedales) high; leaves 9.5 mm. (4½ lines) wide; pistillate spikes 6.35–10.15 cm. (2¼ ad 4 pollices) long and 14.75–16.9 mm. (7–8 lin.) thick; pistillate scales very acute, the lower often produced into a long scabrous awn, often scarcely shorter than the perigynia; perigynia 8.5 mm. (4½ lin.) long, . . . oblong-elliptic, acuminate. This is the large extreme of the American plant, the culms often up to 1.2 m. high, the leaves to 1.2 cm. broad, the pistillate spikes to 2 cm. thick, the perigynia to 1 cm. long. It passes insensibly into smaller plants with gradually smaller and less tapering or quite as tapering perigynia down to 4 mm. long, *C. utriculata*, var. *minor* Boott, l. c., originally described "Perigyniis spicisque brevioribus densifloris". Repeated attempts to find any line of cleavage between the largest extremes (PL. 716, FIG. 9) and the smallest and in shape of perigynia have thus far failed. In fact, whereas the perigynia of small or medium size are fertile, the extremely large ones (FIG. 9) are usually empty, without well developed achenes or blasted, as if lack of fertility might have resulted in overgrowth of the empty

perigynium, perhaps somewhat comparable with the well known late-autumnal vegetative enlargement or prolongation of unfertilized ovaries in *Polygonum*, § *Avicularia*.

My interpretation of North American *Carex inflata* is as follows.

a. Pistillate scales oblong to ovate, blunt to merely acute, not prolonged at tip, shorter than perigynia.
Beak of perigynium prominently toothed, the teeth 0.3–0.7 mm. long; leaves canaliculate to flat, 2–8 mm. broad; pistillate spikes 2–4, 1.5–7 cm. long; perigynia prominently inflated, 3–5 (–6) mm. long .... *C. inflata* (typical).
Beak of perigynium emarginate, the teeth 0.1–0.2 mm. long; leaves canaliculate to involute, 4 mm. broad; pistillate spike 1, 2.7 cm. long; perigynia barely inflated, 5.5–6 mm. long .... Var. *anticostensis*.
a. Pistillate scales narrowly ovate to linear-lanceolate, tapering to acuminate tip or awned, often nearly equaling or the lower often exceeding the perigynia (4–10 mm. long).
Culms coarse, 0.2–1 cm. thick above upper sheath, 0.3–1.2 m. high; leaves 0.4–1.2 cm. broad; pistillate spikes cylindric, 2–15 cm. long, 0.9–2 cm. thick; perigynia crowded, 4–10 mm. long .... Var. *utriculata*.
Culms very slender, barely 1 mm. in diameter, 3–5 dm. high; leaves 2–5 mm. broad; pistillate spikes ovoid to short-oblong, 1–2.5 mm. long; perigynia few, 4–6 mm. long .... Var. *ambigens*.

CAREX INFLATA Hudson, Fl. Angl. 354 (1762), in part, emend. ed. 2: 412 (1778); Rendle & Britten in Journ. Bot. xlv. 444 (1907); Schinz & Thellung in Vierteljahrss. Naturf. Gesells. Zurich, liii. 524 (1908); Mansfeld in Fedde, Repert. Sp. Nov. xlv. 221 (1938). *C. rostrata* Stokes in Withering, Brit. Pl. ed. 2, ii. 1059 (1787); Kükenthal in Engler, Pflanzenr. iv[20]. 720 (1909) and many other European auth. *C. ampullacea* Gooden. in Trans. Linn. Soc. ii. 207 (1794), and many later authors. For fuller synonymy see Kükenthal.—Culms 3–8.25 dm. high, smooth or scabrous at summit; leaves strongly canaliculate or flat, 2–8 mm. broad; pistillate spikes 2–4, cylindric, 1.5–7 cm. long, 6–10 (–15) mm. thick, lax to closely flowered; pistillate scales oblong to ovate, blunt or merely acutish, shorter than perigynia; perigynia inflated-ovoid, membranaceous, 3–5 (–6) mm. long, mostly abruptly beaked.—Europe and western Asia; North America from southern Greenland (fide Kükenthal) and Labrador to Alaska, south to Newfoundland, northern Nova Scotia, northern New Brunswick, northern Vermont, northern Michigan, Saskatchewan, and on high mountains to Colorado and southern California; the more northern nearly typical, the Cordilleran from Alberta southward often with somewhat thicker pistillate spikes. LABRADOR: Anatolak, *C. S. Sewell*, no. 418; Fox Harbor, August 14, 1882, *J. A. Allen* (called *C. utriculata* and sent to

William Boott with the pertinent query: "Is it a form approaching *C. ampullacea?*") NEWFOUNDLAND: Tilt Cove, Notre Dame Bay, *Fernald & Wiegand*, nos. 5064 and 5066; Rushy Pond, Exploits River, *Fernald & Wiegand*, no. 5063; Quarry, *Fernald & Wiegand*, no. 5055; St. Johns, *Robinson & Schrenk*, no. 182. ST. PIERRE ET MIQUELON: Belle-Rivière, Langlede, *Arsène*, no. 139. QUEBEC: Blanc Sablon River, *Fernald & Wiegand*, no. 2967; Lac au Petit Rat, Anticosti, *Victorin*, no. 4036 (broad-leaved); Tabletop Mts., Gaspé County, "alt. ca. 3600 ped.", August 11, 1881, *J. A. Allen*, August, 1906, *Fernald & Collins*, nos. 189 and 441, August, 1923, *Fernald & Smith*, no. 25,599; Roberval, Lake St. John, July 16, 1892, *G. G. Kennedy*. NOVA SCOTIA: St. Paul Island, *Perry & Roscoe*, nos. 125 and 126. NEW BRUNSWICK: Serpentine River, July 21, 1900, *G. U. Hay*. MICHIGAN: Portage River, August 3, 1865, *Porter;* Keweenaw County, *Farwell*, no. 715; Isle Royale, *Cooper*, nos. 224, 233 and 271. MACKENZIE DISTRICT?: "Mackenzie River", *Richardson*, identified by Boott as *C. ampullacea.* SASKATCHEWAN: Lake Athabasca, *Raup*, nos. 6866, 6966 and 7001. ALBERTA: Lake Beauvert, alt. 3470 ft., Jasper National Park, *Edith Scamman*, no. 2325; Lake Louise, *Olson*, August 15, 1909. COLORADO: Evergreen Lake, alt. 9800 ft., Lake County, *Clokey*, no. 3326; 6 miles north of Wolcott, *Shear & Bessey*, no. 5352; near Mt. Harvard, *Shear*, no. 5497. CALIFORNIA: Tallac, alt. 6200 ft., El Dorado County, *Brainerd*, no. 6; Strawberry Creek, alt. 5900 ft., El Dorado County, *Brainerd*, no. 10; Truckee River, alt. ca. 7000 ft., June 25–30, 1897, *Davy;* Kaweah Meadows, alt. 9300 ft., *Purpus*, no. 5137. OREGON: Bear Valley, Blue Mts., *Griffiths & Hunter*, no. 177. ALASKA: Buckland River, Seward Peninsula, *A. E. & R. T. Porsild*, no. 1544; doubtless elsewhere in Alaska (Gray Herbarium material from there interned in Sweden). PL. 715, FIGS. 1–4).

Var. **anticostensis,** var. nov. (TAB. 715, FIG. 5 et 6), culmo 6 dm. alto crasso; foliis margine valde involutis 4 mm. latis; spica foeminea solitaria crasso-oblonga 2.7 cm. longa; squamis oblongo-ovatis obtusis vel subacutis atropurpureis; pergyniis oblongo-conicis, vix (?) inflatis in rostrum emarginatum vel breviter bidentatum attenuatis, dentibus 0.1–0.2 mm. longis. QUEBEC: eau peu profondes sur le calcaire, Petites-Rivières, Anticosti, 20 juillet 1926, *Victorin & Rolland*, no. 25,767 (TYPE in Herb. Gray.).

A very doubtful plant. Until more mature specimens are available better placed with *C. inflata* than elsewhere on account of its fleshy culms and septate-nodulose obviously glaucous foliage.

Var. UTRICULATA (Boott) Druce in Bot. Soc. & Exchange

Club Brit. Isl. ix. 141 (1930). *C. utriculata* Boott in Hook. Fl. Bor.-Am. ii. 221 (1839) and many later auth. *C. utriculata*, var. *minor* Boott, l. c. (1839) and many later auth. *C. ampullacea*, var. *utriculata* (Boott) Carey in Gray, Man. 566 (1848). *C. ampullacea*, var. *maxima* Anderss. in Bot. Notis. för 1849: 29 (1849). *C. ampullacea*, α. *altissima* Anderss. Cyp. Scan. 20 (1849). *C. ampullacea*, var. *robusta* Sonder, Fl. Hamb. 505 (1851). *C. rostrata*, var. *latifolia* Aschers. Fl. Brandenb. i. 792 (1864). *C. rostrata*, var. *utriculata* (Boott) Bailey in Proc. Am. Acad. xxii. 67 (1886). *C. rostrata*, var. *Cliftonii* Farwell in Rep. Mich. Acad. Sci. vi. 204 (1904). *C. rostrata*, var. *utriculata*, forma *minor* (Boott) Kükenthal in Engler, Pflanzenr. iv[20]. 722 (1909), at least as to source of name.—Southern Greenland and Labrador to British Columbia, south to Newfoundland, Nova Scotia, New England, Long Island, Delaware, District of Columbia, West Virginia, Ohio, Indiana, Wisconsin, Minnesota, South Dakota, New Mexico and California; northern Europe and northeastern Asia. Citation of specimens seems unnecessary. Pl. 716, showing variations.

I am retaining for the polymorphous and commonest plant of North America the varietal name *utriculata*. This name was given by Boott to the American plant as a species, with *C. utriculata*, var. *minor* as a small variety of it. Extreme literalists might argue that, since the latter is the earliest varietal name within this series as I conceive it, it should be taken up for the whole concept. The Guiding Principles of the International Rules of Botanical Nomenclature prescribe in Art. 4 that we should "avoid or . . . reject . . . names which may cause error or ambiguity". If anything might cause error or ambiguity it would be the forcing upon a plant, which differs from the type of the species in much greater stature, much larger spikes, longer perigynia and prolonged scales, the varietal name *minor*. I am not of the purely legalistic group who would exclude reason and common sense from their work and who believe that scientific procedure should be governed by purely mechanical rules.

Var. **ambigens** (Fernald), comb. nov. *C. rostrata*, var. *ambigens* Fernald in Rhodora, iii. 51 (1901).—For description see key.—The following are placed here. Quebec: Lac des Americains, alt. 670 m., western base of Table-topped Mountain, Gaspé County, *Fernald & Collins*, no. 443; by alpine ponds, alt. 1100–1250 m., Table-topped Mountain, *Fernald & Collins*, no. 445; in marly arbor-vitae swamp, New Carlisle, Bonaventure

County, July 28, 1902, *Williams & Fernald.* NEW BRUNSWICK: South Tobique Lakes, July, 1900, *G. U. Hay*, nos. 7, 9, 41 and 51. MAINE: wet sandy shore, St. Francis, Aroostook County, Fernald, no. 2076. PL. 715, FIGS. 7–9.

In PLATE 715, FIGS. 1–4 are of CAREX INFLATA: FIG. 1, typical spikes, × 1, from Seine-et-Marne, *Camus*, no. 363[2]; FIG. 2, portion of fruiting spike, × 4, from no. 363[2]; FIG. 3, portion of coarser American form, × 1, from Bear Valley, Blue Mountains, Oregon, *Griffith & Hunter*, no. 177; FIG. 4, portion of fruiting spike, × 4, from no. 177. FIGS. 5 and 6, var. ANTICOSTENSIS: FIG. 5, inflorescence, × 1, FIG. 6, portion of pistillate spike, × 4; both from TYPE. FIGS. 7–9, var. AMBIGENS: FIG. 7, inflorescence, × 1, from St. Francis, Maine, TYPE; FIG. 8, riper inflorescence, × 1, from South Tobique Lake, New Brunswick, *Hay*, no. 41; FIG. 9, portion of pistillate spike, × 4, from no. 41.

PLATE 716, variations of CAREX INFLATA, var. UTRICULATA: spikes × 1; enlargements, × 4: FIGS. 1 and 2, from Mystic Pond, Middlesex County, Massachusetts, July 4, 1861, *Wm. Boott;* FIGS. 3 and 4, from Tadousac, Saguenay County, Quebec, August 12, 1892, *G. G. Kennedy;* FIGS. 5 and 6, exceptionally attenuated spikes with exaggerated long scales, from Birchy Cove (Curling), Newfoundland, *Fernald & Wiegand*, no. 2965; FIGS. 7 and 8, unusually short spikes, from Whitefield, New Hampshire, July 7, 1896, *Walter Deane;* FIG. 9, from Isle Royale, Michigan, *Cooper*, No. 237.

APOCYNUM SIBIRICUM VAR. CORDIGERUM IN NEW ENGLAND.—*A. sibiricum* Jacq., var. *cordigerum* (Greene) Fernald[1], characterized by ovate or oblong-ovate, strongly cordate and clasping cauline leaves, was recorded by Woodson (Ann. Missouri Bot. Gard. xvii. 141 (1930)) only from the upper Mississippi Valley. Its range has since been extended to eastern New York; Tripoli, Washington Co., *S. H. Burnham*, July 5, 1914, is the easternmost station previously known. It seems to be nowhere common; the discovery of a large and perfectly typical colony in an old field near Springfield, Vermont (*C. A. & Una F. Weatherby*, June 29, 1942) is, therefore, perhaps worth recording. The usual habitat for the variety, as given in literature and on herbarium-labels, is on shores of streams and lakes, but it has been found before in old fields. Springfield is a busy manufacturing town and therefore a likely place for introduced species; but the A*pocynum* was well out of town and accompanied by no western weeds; the station may reasonably be regarded as native.

One striking feature of the colony was the extraordinary uniformity of the thousand or more individuals comprising it. There was no obvious difference among them, except in height

[1] For the nomenclature and range of this variety, see Fernald in RHODORA xxxvii. 327 (1935). It is an extreme development of the plant called *A. cannabinum* var. *hypericifolium* in Gray's Manual.

and degree of development. This suggests that the colony may be a clone, propagated by the long, deep-seated, horizontal rootstocks.

Although the variety in characteristic form seems not to have been previously found in New England, two other collections, both in the herbarium of the New England Botanical Club and both showing only the upper portion of tall plants, approach it. These are: South Deerfield, Massachusetts, *Churchill*, June 26, 1925, with strongly clasping, but oblong-lanceolate, upper leaves; and Tyngsboro, Massachusetts, July 3, 1916, *Hunnewell* 4189, with oblong and cordate-based, but not clasping upper leaves.—C. A. Weatherby, Gray Herbarium.

MORE BERKSHIRE PLANTS

George J. Wallace

Three years ago the half dozen species new to the Berkshire flora found during a spring and summer census of the flowering plants at Pleasant Valley Bird and Wild Flower Sanctuary in Lenox, Massachusetts, were reported in this journal[1]. Continued work with plants since then has incidentally disclosed other new forms and new distributional data.

Several hundred additions have been made to the plants found on the Sanctuary, the additions roughly divisible between new discoveries (mostly on newly acquired land), selected introductions in fern and wild flower plantings, and further determinations among the grasses and sedges. The total recorded to date (1938–1941 inclusive) comprises 859 forms (825 species and 34 varieties) of pteridophytes and spermatophytes. Considering the number of obscure forms undoubtedly overlooked or not identified (plant identification has been an incidental part of the Sanctuary program) it seems reasonable to conclude that well over a thousand forms of higher plants are to be found on this 455 acre tract.

New Berkshire species not previously reported, and others that merit mention because of new distributional data, are listed in the following paragraphs.

[1] Rhodora **41**: 128–130. 1939.

Potamogeton Hillii Morong. Material tentatively identified as this species in 1938 was collected in better fruiting condition in 1939 and has been preserved in the Sanctuary herbarium. In 1939 also William A. Weber found this species in South Egremont, the first reported locality in Massachusetts.[1] The station at the Sanctuary, noted in only one place in a Beaver dam in 1938, has since spread widely over the ponds, raising the speculation that the seed may have come in with the beavers from New York, where the pondweed has long been known to occur. In fact a letter from Mr. William H. Carr, Director of the Bear Mountain Trailside Museums, explains that *P. Hillii* occurs in the park from which these beavers were taken and that branches and other materials were also brought along in transplanting the animals from Bear Mountain Park to the Sanctuary.

Phalaris canariensis L. It may seem superfluous to mention the occurrence of this canary grass, not previously listed for the county, but a form which is apt to spring up wherever bird feeding operations involving canary grass seeds are carried out. Incidentally the well-filled heads suggest its high potential value as a grain to be grown for seed-eating birds.

Trillium grandiflorum (Michx.) Salisb. Though often considered a native plant in this region, this trillium was not included in Hoffmann's Flora of Berkshire County[2], probably on the grounds that it is not strictly indigenous. Several well-established stands occur in the Sanctuary woods, but there is every reason to believe that they originated from earlier plantings. Similarly the numerous reports of other local stations never seem to be entirely free from the suspicion that they may have resulted from deliberate introductions.

Gypsophila muralis L. In the summer of 1941 several specimens of this European pink were found growing among introduced lime-loving ferns. The ferns in question came from Sheffield, so whether or not that explains the origin of the Gypsophila, it is a new occurrence for Berkshire County.

Potentilla intermedia L. In the summer of 1939 Miss Betty Mitchell, Museum hostess for the Sanctuary, picked a specimen of this species for a wild flower exhibit, and remarked that the plant did not look like the other cinquefoils in the collection. A check-up showed that it was *P. intermedia*, a new species for the County, and reexamination of the area from which it came disclosed a dozen other specimens. Its sudden appearance in numbers in a meadow next to the buildings is something of a mystery, since it could hardly have been overlooked the previous summer if it flowered.

[1] Rhodora **42**: 95, 1940.

[2] Hoffman, Ralph, *Flora of Berkshire County, Massachusetts.* Proc. Boston Soc. Nat. Hist. **36**: No. 5, 1922, pp. 171–382.

Lathyrus pratensis L. Mr. George Seeley and his sister, Miss Laura Seeley, of Stockbridge brought a specimen of this species to the Sanctuary for verification, as it was a plant which they had not previously encountered in much botanizing in and around Stockbridge. No plants of the genus Lathyrus were recorded for the County by Hoffmann. In the summer of 1941 the Seeleys brought rooted specimens which were planted in a gravelly situation resembling the location from which they came.

Ajuga reptans L. In late May 1939 Dr. and Mrs. Work of Pittsfield surprised and embarrassed me by asking about an unfamiliar mint growing near some fern plantings where I had spent hours of planting and weeding. It proved to be this European species of Ajuga. It seems probable that the seed came in with some pink New England asters (*Aster novae-angliae* forma *roseus*) which the late Mr. Francis brought from an unrecorded source. *A. genevensis* L. was listed by Hoffmann for the Pittsfield region, but there is no mention of *A. reptans*.

Chelone Lyoni Pursh. In late summer (Sept. 13) 1941 this rose-flowered southern species of turtlehead was found growing at the edge of a woodland swamp at the Sanctuary. Hoffmann records its occurrence for several rods along a brook in Stockbridge, some six miles south of here.

Lonicera Morrowi Gray. This species, like *Phalaris canariensis*, may be a trivial addition, since it is obviously an escape from cultivation. The summit of Baldhead Mountain (now partly Sanctuary property), a wild abandoned tract of land that long ago was the site of several dwellings, features an abundance of this honeysuckle, which has spread far into the adjacent woods.

Lapsana communis L. A robust, heavily fruiting specimen of this weed appeared in the Sanctuary Fernery in 1941, and, perhaps to our future sorrow, was allowed to survive because of its apparent rarity in this region. In 1920 Hoffmann found a single plant in Lee and "a few plants only" in Lenox. There has been no mention of its previous or subsequent occurrence.

Game Division, Department of Conservation,
Lansing, Michigan

NOTES ON THE FLORA OF NOVA SCOTIA—III

A. E. Roland and W. G. Dore

Continued field work in Nova Scotia has resulted in the following records of plants rare or new to the province. As in previous lists, if no comment is made, no other published record of the

occurrence of the plant in this area is known to the authors. Specimens of the majority of the collections are in the herbarium of the Nova Scotia Agricultural College, Truro, N. S., while many of the grasses are placed in the herbarium of the Division of Botany, Department of Agriculture, Ottawa. Where not mentioned in citations, the collectorship has been by the senior author.

Muhlenbergia foliosa (Roem. & Schult.) Trin. Kings Co.: headwaters of the Halfway River (Roland, 2052).

Muhlenbergia foliosa, var. setiglumis (S. Wats.) Scribn. Hants Co.: rocky margin of Ste. Croix River (Roland, 39,088).

Sphenopholis intermedia (Rydb.) Rydb. To the few records under *S. pallens*, the following may be added;—Victoria Co.: limestone cliff-crevice near Baddeck; July 12, 1940 (Dore, 931); growing in gypsum gravel at old quarry, Iona, July 14, 1940 (Dore, 932).

Trisetum spicatum (L.) Richter, var. molle (Michx.) Beal. Collected, for probably the first time in the province, in Inverness Co.: growing on an old logging road in woods north of Cheticamp (Dore, 933).

Trisetum spicatum, var. pilosiglume Fern. A more northerly ranging variety in North America than the preceding. Inverness Co.: growing on road in woods, Cheticamp (Dore, 934). Victoria Co. common on dry rocky outcrops along the Salmon River, Bay St. Lawrence (Roland, 41,121).

Trisetum flavescens (L.) Beauv. This grass, of some forage value in European meadows and pastures, has probably been introduced in commercial grass seed. It is persisting well in a closely grazed pasture at Meteghan, Digby Co. (Dore, 935 and 936).

Arrhenatherum elatius (L.) Mert. & Koch. The first record known of the escape and persistence of this grass in the province is at the "Illustration Farm", Chegoggin, Yarmouth Co. (Dore, 954).

Eragrostis cilianensis (All.) Link. Growing in waste ground around the harbour docks at Halifax, Oct. 18, 1938 (Dore, 568).

Molinia caerulea (L.) Moench. The common grass of the upland moors of northern Europe is well established in and about the town of Louisburg, Cape Breton Co. As in its native region, it tends to form large tussocks in the peaty, highly acid soils. This is probably the only known location at which this grass is found in Canada.

In Newfoundland an old record from the West Coast is based

on the work of LaPylaie early in the last century. The plant has not been rediscovered there as yet.[1]

Schizachne purpurascens (Torr.) Swallen. The only previous collection seen for the province was made by Macoun at Big Intervale, Inverness Co. in 1898. This grass has now been found in rich woods and recent clearings near Cheticamp, Inverness Co. (Dore, 893 and 894, July 4 and 7, 1940); and scattered along the Salmon River, Bay St. Lawrence, Victoria Co. (Roland, 41,118, July 21, 1941).

Cynosurus cristatus L. Since a collection made by Groh on July 28, 1936, at Baddeck, Victoria Co., this species has not been encountered.

Nardus stricta L. First discovered in Canada by J. H. Whyte in a sterile pasture at Weedon, Wolfe Co., in southern Quebec. Its presence in Newfoundland and Greenland has been known for a long time. The plant was found growing in an old pasture at Clyde River, Shelburne Co. (Dore, 930, August 2, 1940), and a reliable sight-record exists for Tusket, Yarmouth Co.

Carex hirtifolia Mack. The range of this sedge is here extended from New Brunswick southward to the central part of Nova Scotia where it is rather common. Hants Co.: rich wooded intervale near Shubenacadie. Colchester Co.: shaded intervale west of Brookfield.

Luzula parviflora (Ehrh.) Desv. Victoria Co.: scattered along the streams and woodland paths about Bay St. Lawrence.

Tofieldia glutinosa (Michx.) Pers. Poorly drained, peaty soil near Cheticamp (Dore, July 6, 1940).

Saxifraga Aizoon Jacq. Inverness Co.; a large colony on the dry shaded side of a ravine above Cheticamp.

Fragaria vesca L., var. americana Porter. This plant, which Fernald[2] reports from gypsum near Five-Mile River, Hants Co. and from gypsum cliffs near Port Bevis, Victoria Co., seems to be restricted to calcareous slopes or to gypsum outcrops. The following localities are typical:—Kings Co.: side of the basaltic North Mountain, Lower Pereau (Groh, July 1, 1930). Cumberland Co.: scattered on shale cliffs, Moose River. Hants Co.: open woods in a gypsum area, Brooklyn (Dore, June 24, 1940). Antigonish Co.: abundant on wooded gypsum, Antigonish Harbour. Inverness Co.: on gypsum talus, Cheticamp (Dore, July 6, 1940). Victoria Co.: common in the open on dry gypsum outcrops, near Cape North Corner.

Potentilla canadensis L. Rossbach[3] cites a collection of Fernald's from dry gravelly barrens and fields, Shelburne, N. S. It is apparently becoming introduced into barren or open sterile

[1] Fernald, Rhodora, xxxv. 137 (1933).
[2] Fernald, Rhodora, xxiii. 267 (1921).
[3] Rossbach, Rhodora, xl. 246 (1938).

locations in the southern parts of the province. Halifax Co.: scattered in dry, open areas and flowering abundantly on June 5th, 1941, Point Pleasant Park, Halifax. Yarmouth Co.: pasture by Mountain Cemetery, Yarmouth (Trefry, June 12, 1938).

POTENTILLA REPTANS L. Becoming a weed in the southern parts of Yarmouth Co. Around the wharves at Yarmouth (Roland, July 30, 1937).

EMPETRUM EAMESII Fern. & Wieg. Halifax Co.: exposed headland, growing with *E. nigrum* (Dore, Aug. 18, 1940). Formerly reported from the northern tip of Cape Breton Island.[1]

CARUM CARVI L., f. RHODOCRANTHUM A. H. Moore. Cumberland Co.: a few scattered plants with pinkish flowers were found among the common plants of the species at Parrsboro, July 1, 1941.

MYOSOTIS VERSICOLOR (Pers.) Sm. Kings Co.: well established in places on the ridge above Wolfville.

PRUNELLA VULGARIS L., var. LANCEOLATA (Barton) Fern., f. CANDIDA Fern. White-flowered plants of the self-heal are common about Pleasant Bay, and were also collected at Cap Rouge, Inverness Co. (Roland 41,680).

LAMIUM AMPLEXICAULE L., f. CLANDESTINUM (Reichenb.) G. Beck. Groh writes from Ottawa that the species has been sent to him for identification from Bridgetown, Annapolis Co. The form with the small unexpanded corollas has persisted for years about the gardens at the Agricultural College, Truro.

SENECIO AUREUS L. As in southwestern Nova Scotia, *Senecio Robbinsii* is common everywhere in swales and wet areas throughout the centre of the province. *S. aureus* was seen only twice. Colchester Co.: one patch in brookside alluvium, Upper North River. Cumberland Co.: abundant in an open meadow west of Parrsboro (Roland, 41,740).

SENECIO PSEUDO-ARNICA Less. Yarmouth County: abundant on a barrier beach south of Sand Beach. Known previously from Sable Island[2], and from Canso, Guysboro Co.[3]

HIERACIUM MURORUM L. Occasionally introduced around the coast. Lunenburg Co.: edge of town, Bridgewater (Groh, June 16, 1928). Cape Breton Co.: roadside near Sydney (Roland, Aug. 25, 1937).

HIERACIUM CANADENSE Michx., var. HIRTIRAMEUM Fern. Occasional collections from the northern part of the province seem to belong to this more hairy and glandular variety. The following collections are in the National Herbarium at Ottawa:—

[1] Fernald, Mem. Gray Herb. ii. 263 (1925).

[2] St. John, Proc. Bost. Soc. Nat. Hist. xxxvi, 96 (1921).

[3] Rousseau, Contrib. Inst. Bot. Univ. Montréal, xxxii, 46 (1938).

Victoria Co.: Baddeck Bay, Aug. 11, 1898 (Macoun); Halfway House, Aug. 4, 1898 (Macoun). Guysborough Co.: Boylston, not common, Sept. 1890 (C. A. Hamilton).

Nova Scotia Agricultural College, Truro; and
Dalhousie University, Halifax, N. S.

THE STATUS OF ASTER LONGULUS SHELDON

L. H. Shinners

Aster longulus Sheldon was described from plants collected in Minnesota, and is listed in Rydberg's *Flora of the Rocky Mountains* and *Flora of the Prairies and Plains* as occurring from Saskatchewan to Minnesota, Nebraska, Colorado and British Columbia. Through the kindness of Dr. C. O. Rosendahl of the University of Minnesota, I have recently been able to examine Sheldon's type. The plant is apparently a hybrid of *Aster junciformis* Rydb. and *A. puniceus* L., as indicated by the following table of critical characters:

A. junciformis	*A. longulus*	*A. puniceus*
Stem glabrous or pubescent in lines	Stem hispid-pubescent over the surface	Stem hispid-pubescent over the surface
Leaves slightly or not at all clasping, glabrous except on the margins and occasionally toward the tip on the upper surface; areoles formed by the veins longer than wide	Leaves slightly clasping, glabrous beneath, scabrous above; areoles as long as or longer than wide	Leaves auriculate-clasping, scabrous above, pubescent beneath; areoles as wide as or wider than long
Leaf-blades linear or lance-linear, 5–12 cm. long, 0.25–0.6 cm. wide; commonly 14–20 times as long as wide	Leaf-blades lance-linear, largest one 7.8 cm. long, 0.5 cm. wide; nearly 16 times as long as wide	Leaf-blades narrowly to broadly lanceolate or oblong-lanceolate, 7–15 cm. long, 1.0–2.5 cm. wide; 5–9 times as long as wide
Involucres 5.5–8.0 mm. high	Involucres about 6 mm. high (not fully mature)	Involucres 7–12 mm. high
Outer phyllaries shorter than the inner, not foliaceous	Outer phyllaries about as long as the inner, foliaceous	Outer phyllaries as long as or longer than the inner, foliaceous
Rays white, rarely pink or pale lilac	Rays "lilac-purple to white" (Sheldon)	Rays usually light violet-blue or purplish-blue
Style-tips with the pubescent apex 1½–3 times as long as the glabrous part	Style-tips with the pubescent apex about twice as long as the glabrous part	Style-tips with the pubescent apex about as long as the glabrous part

Plants similar to the type of *Aster longulus* might have been produced by a cross between *A. paniculatus* and *A. puniceus.* Nearly all the characters listed under *A. junciformis* can be found in *A. paniculatus,* which also occurs in Minnesota. In *A. paniculatus,* however, the pubescent portion of the style-tips is only 1–1½ times as long as the glabrous portion; the leaves average 12–16 times as long as wide, and the inflorescence is usually paniculate rather than corymbose or corymbose-paniculate as in the three species in the above table. It is suggestive that a second collection listed by Sheldon as *A. longulus* (near Center City, Chisago Co., Minnesota, *B. C. Taylor,* August, 1892) is pure *A. junciformis.* Furthermore the type specimen of *Aster longulus* was coming into flower in July, the usual time for *A. junciformis,* but a month or more too early for *A. paniculatus* or *A. puniceus* in most years. *A. longulus* may then be cited as follows:

× *Aster longulus* Sheldon, Geol. Nat. Hist. Surv. Minn. Bull. 9, Bot. Ser. II (Minn. Bot. Studies vol. 1): 18, 1894. (*A. junciformis* × *A. puniceus.*)—Apparently rare; definitely known only from the type collection, but to be expected where the ranges of the two parents overlap: from Ontario to Saskatchewan, south to Minnesota, Wisconsin, northern Indiana and New York.

Judging from Rydberg's descriptions of *Aster longulus* (calling for a plant with stem pubescent in lines only), and the range given by him, he used the name for narrow-leaved forms of *A. coerulescens* DC. and its close relative *A. laetevirens* Greene[1], one or both of which occur commonly throughout most of the range assigned to *A. longulus.*

Rydberg also reported *Aster longifolius* Lam. in the *Flora of the Prairies and Plains* as occurring inland to Minnesota and Saskatchewan, but as has been pointed out in another paper[2], that species is confined to the vicinity of the Atlantic coast from New England northward. Rydberg's description suggests that he included forms of *A. paniculatus* and *A. coerulescens* under *A. longifolius.*

Botany Department, University of Wisconsin,
Madison, Wisconsin.

[1] See descriptions given by Wiegand in "*Aster paniculatus* and some of its relatives." Rhodora **35**: 16–38. 1933.

[2] Shinners, L. H. The genus Aster in Wisconsin. Amer. Midl. Nat. **26**: 398–420. 1941.

Three Transfers in the Compositae.—

Erigeron strigosus Muhl., forma **discoideus** (Robbins), comb. nov. *E. strigosus*, var. *discoideus* Robbins ex Gray, Man. ed. 5: 237 (1867). *E. ramosus*, var. *discoideus* (Robbins) BSP. Prelim. Cat. N. Y. Pl. 27 (1888). *E. ramosus*, forma *discoideus* (Robbins) Dole, Fl. Vt. ed. 3: 266 (1937).

E. strigosus, var. **septentrionalis** (Fernald & Wiegand), comb. nov. *E. ramosus*, var. *septentrionalis* Fernald & Wiegand in Rhodora, xv. 60 (1913).

The preceding transfers are necessitated by *Erigeron ramosus* Raf. Fl. Ludov. 66 (1817) which invalidates the combination *E. ramosus* (Walt.) BSP. (1888), based upon *Doronicum ramosus* Walt. Although it would be possible to argue that Rafinesque's *E. ramosus* might have been some form of *E. strigosus*, especially *E. strigosus*, var. *Beyrichii* (F. & M.) Torr. & Gray, his description, based, not upon actual material before him, but upon the pretty sketchy account by Robin, is too vaguely typified. I agree with Dr. Blake and others in recent publications from the National Herbarium that Rafinesque's name should not be taken up.

Heliopsis helianthoides (L.) Sweet, var. **scabra** (Dunal), comb. nov. *H. scabra* Dunal in Mém. Mus. Paris, v. 54 (1819). *H. laevis*, γ. *scabra* (Dunal) Torr. & Gray, Fl. ii. 303 (1842).

Repeated efforts to find what I consider sound specific characters in *Heliopsis scabra* have forced me to the conclusion that it is a campestrian extreme of the variable *H. helianthoides*, differing, as would be expected from its relatively open habitat, as contrasted with the often shaded habitat of the latter, in its more scabrous leaves, and some pubescence on the angles of the young achenes. In the East the ranges overlap, but typical *H. helianthoides* extends westward only to southern Ontario and Minnesota, south to North Carolina (var. *solidaginoides* (L.) Fernald to Georgia and Alabama), Ohio, Indiana and Illinois. Var. *scabra* occurs westward to southern British Columbia, southward to Tennessee, Arkansas, Texas and New Mexico.

M. L. Fernald, Gray Herbarium.

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Photo. B. G. Schubert.

NUPHAR ADVENA: FIG. 1, young plant with translucent submersed leaves, × 1; FIG. 2, flower, laid open, × 1.

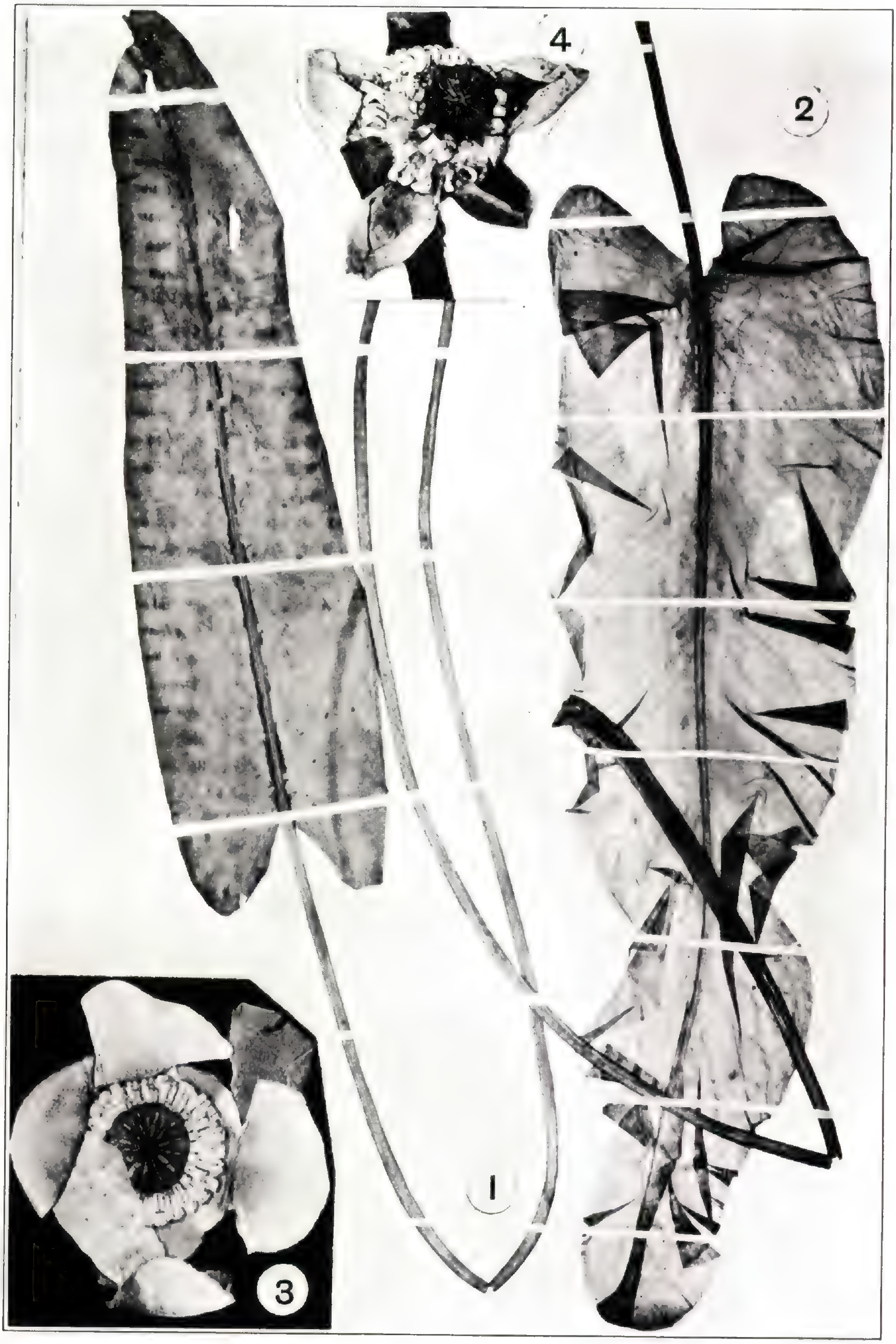

Photo. B. G. Schubert.

NUPHAR SAGITTIFOLIUM: FIG. 1, floating leaf; FIG. 2, submersed leaf; FIGS. 3 and 4, flowers, laid open; all × 1.

Rhodora

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXLV

THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(Plates 717–744)

Part I. High Lights of Field-trips in 1941

My records show that from September, 1933, to August, 1940, my companions and I, in 30 trips of three days to two weeks each in tidewater Virginia, had collected approximately 650 flowering plants and vascular cryptogams not previously recorded as definitely growing in the state. In addition, of course, there are many species, like *Burmannia biflora*, which had long been supposed to be extinct in the state but for which living stations are now known. The results of our four trips in 1941, supplemented by old collections not previously worked out, brought the returns to 751. This brief statement is here made to clarify the title of the present paper. It should not be inferred that there are six preceding reports with essentially similar titles.[1] Unfortunately the present title is misleading, in that

[1] The preceding papers on the work in Virginia are as follows: Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189, 20 plates (1935)—Contrib. Gray Herb. CVII; Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413 and 423–554, 22 plates (1935)—Contrib. Gray Herb. no. CIX; Fernald, *Plants from the Outer Coastal Plain of Virginia*, Rhodora, xxxviii. 376–404 and 414–452, 13 plates (1936)—Contrib. Gray Herb. no CXV; *Local Plants of the Inner Coastal Plain of Southeastern Virginia*, Rhodora, xxxix. 321–366, 379–415, 433 459 and 465–491, 14 plates (1937)—Contrib. Gray Herb. no. CXX; *Noteworthy Plants of Southeastern Virginia*, Rhodora, xl.

364–424, 434–459 and 467–485, 27 plates (1938)—Contrib. Gray Herb. no. CXXIII; *Last Survivors in the Flora of Tidewater Virginia*, Rhodora, xli. 465–502, 529–559 and 564–577, with 14 plates (1939)—Contrib. Gray Herb. no. CXXVIII; *A Century of Additions to the Flora of Virginia*, Rhodora, xlii. 355–416, 419–498 and 503–521, with 24 plates (1940)—Contrib. Gray Herb. no. CXXXIII; *Another Century of Additions to the Flora of Virginia*, Rhodora, xliii. 485–553, 559–630 and 635–657, with 26 plates (1941)—Contrib. Gray Herb. no. CXXXIX.

Since the publication of the previously enumerated reports on our work in southeastern Virginia a paper by another "furriner" has appeared: the *Check List of the Ferns and Flowering Plants of the Seashore State Park, Cape Henry*, by Frank E. Egler, published by the New York State College of Forestry (February 1, 1942). The almost pioneer work on the region by Kearney in 1898 is mentioned; but no records are taken from Kearney's enumeration of species nor is his well known cautious scientific method followed. Clearly cited by Kearney were many species of Cape Henry which will not be new discoveries when others find them there: *Andropogon virginicus* var. *tetrastachyus* (*A. tetrastachyus*), *Panicum oligosanthes* (*P. pauciflorum*) *Cyperus diandrus* and *C. Grayi*, *Eleocharis flavescens* (*E. ochreata*), *E. microcarpa* (*E.* "*prolifera*"), *Rhynchospora cymosa*, *Myrica cerifera* (difficult not to see), *Drosera intermedia*, *Physalis maritima* (*P.* "*viscosa*"), *Solanum nigrum*, and others. Kearney's work was done in 1898 and his report was so familiar as to be specially noted by the author of the *Check List*. He did not have for it the sophisticated excuse for neglecting the species enumerated in it which he assumed for the later and somewhat intensive collecting at Cape Henry done in 1933 by Griscom and me, in 1934 by Long and me, and in 1935 by Griscom, Long, Fogg and me. This work is easily dismissed by the following sentence: "The results of the intensive investigations of R. F. Fernald [whoever he may be] on the Flora of southeastern Virginia are continuing to come from the press, and it is believed that until tidewater Virginia again becomes quiescent, a paper of this type should adhere to the status quo" (Egler, p. 15). Just what is the "status quo" is not explained. The author might have stopped with Gronovius or, at least, with Kearney, instead of disturbing the "quiescent" state of knowledge by including in a list of Virginian plants names, like *Carex Kobomugi*, *Juncus effusus* var. *costulatus*, *Euphorbia supina* and *Vaccinium marianum*, which are not in any of the manuals listed as establishing the aforementioned status.

And why desecrate very violently this sacred status by intruding into the *Check List* species which are really not known from Virginia? *Cyperus dentatus* is listed (p. 5) as an ecological ingredient of "The Panicum-Ammophila Community". This very definite species, inhabiting pond- and river-margins from Quebec to Delaware and Maryland, would not be expected by those who know it to associate with *Ammophila breviligulata*, *Panicum amarum*, *Uniola paniculata* and *Iva imbricata*, and especially south of Chesapeake Bay. The specimen so identified (preserved at the New York Botanical Garden) is of the semicosmopolitan and aggressive weed, *C. esculentus*. "The Quercus cinerea Community" (p. 7) is made to include the Century-plant, *Agave americana* (on p. 8), although in the *Check List* (p. 28) it appears as the wholly different *A. virginica*. *Agave americana*, it seems almost superfluous to say, is a Mexican species, though now somewhat naturalized in southern Texas and in Florida; while in Virginia *A. virginica* is quite unknown from the tidewater counties. Incidentally, though most important, *Agave* has the characteristic inferior ovary of the *Amaryllidaceae*. The specimen collected by Egler is in fruit; it has the superior capsule subtended by the persistent perianth and came from a plant of the common *Yucca* of sands of southeastern Virginia. It was properly listed by Kearney. "The Juncus Community" (p. 8) contains "*Rumex persicaria*", changed on p. 32 to *R. Patientia*. There is no described species called *R. Persicaria*, though *R. persicarioides* is a rare plant of the coast from the lower St. Lawrence to New England and on the Pacific slope; and *R. Patientia* is, in America, common only in Newfoundland, Canada and the northern states, not generally south of the District of Columbia. Egler's material belongs to the almost cosmopolitan weed of disturbed soils, *R. crispus*. "The more common species of the pine-oak-hickory forest" include "*Carex gravida*" and "*Agave americana*"; and others which are undoubtedly present. The fact, however, that *Carex gravida* is a characteristic species of low prairie and bottomlands,

the actual record is here brought above the middle of the eighth century.

In 1941 Mr. Bayard Long and I could not get back to our headquarters south of Petersburg until June, our field-work then covering the period of June 11–21. Our former drivers all being unavailable, we drew for this trip a lively and temperamental young man, keen on fast but very skillful driving but far keener on stunt-flying. It was most difficult for him to understand how anyone could be interested in things terrestrial and to believe that we had not made the journey to Virginia primarily to let him scare the lives out of us by taking us up and exhibiting his stunts; and he disliked to keep his car within the ordinary speed expected on Virginia roads. We consequently covered intermediate territory quickly and got promptly to remote points needing exploration. Our driver, like the proverbial

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as yet not authoritatively recorded from east of southern Ontario, Ohio and Missouri, might have led to caution, not to disturb the status quo. Many such plants are on the calcareous bottoms of tidewater Virginia but not on the dune-sands of Cape Henry. The plant collected by Egler is the common and usually abundant *C. Muhlenbergii* of dry and sterile soils from southern Maine to Florida and westward. "*Sabatia brachiata*" (p. 13) of "*The Tidal Marsh Zone*" is presumably *S. stellaris*, an annual with pink or white flowers on scattered and elongate alternate peduncles, a species which really grows on tidal marshes, already so noted by Kearney. *S. brachiata* is a very different plant of dry pinelands, a square-stemmed biennial with opposite branching and crowded flowers in dense corymbiform panicles.

Had the author embraced the opportunity, freely offered him when he was there, to check over the collection from Cape Henry in the Gray Herbarium, he might have eliminated some misidentifications; at least he could have added many conspicuous and still more rather inconspicuous species to his list: *Lycopodium inundatum* var. *Bigelovii*, *Triodia Chapmani*, *Aristida lanosa*, *Paspalum supinum*, *Panicum rhizomatum* and many others, *Cyperus densicaespitosus*, *Psilocarya scirpoides* var. *Grimesii*, *Rhynchospora fascicularis*, *Carex Walteri* var. *brevis*, some species of *Xyris*, *Spiranthes gracilis*, *Cassia nictitans*, the very handsome *Centrosema virginianum*, *Desmodium Dillenii* and *strictum*, *Lespedeza Stuevei* and *stipulacea*, *Ludwigia brevipes*, *Polypremum procumbens*, *Linaria canadensis*, *Utricularia subulata*, *Oldenlandia uniflora*, *Eupatorium serotinum*, *Solidago erecta*, *Aster undulatus*, *Gnaphalium calviceps* (type from Cape Henry), *Bidens discoidea*, *Hieracium venosum*, and many more.

In fact, study of a single well known work on a single genus, Hitchcock and Chase's *North American Species of Panicum* (1910), would have considerably extended the *Check List*. Egler includes a total of only 8 species of this large genus. Hitchcock and Chase definitely cite from Cape Henry 10 others. The collectors noted by them of only one species at Cape Henry (*P. aciculare*) are enumerated as Chase, Hitchcock, Kearney, Mackenzie and Williams; while under another (*P. scoparium*) Coville and Noyes are also cited as having collected at Cape Henry. In short, the number of botanists who preceded the author of the *Check List* in making collections at Cape Henry is considerable. Unless the intellectual curiosity of those who visit this unique area is to be completely satisfied by a mere quiescent status quo, it is evident that, without disturbing that comfortable and unprogressive condition of *laissez faire*, a much more complete check list could be prepared simply by consulting the many collections and records made by those who visited Cape Henry before it became a State Park.

sailor, had or formerly had girl-friends at many points about the southeastern counties and he introduced us to new areas and to homes in the country, where, without his introduction, we should not have ventured. We also, of course, returned to many familiar areas for special plants.

The marly bluffs and the beaches and marshes of the lower James in Surry and Isle of Wight Counties had, in 1940, yielded such a concentrated upland calcicolous flora, that we promptly returned there. Going back to Bailey's Beach, near Rushmere, for good material of *Carex decomposita*, discussed in the last paper, we found that here, as at other points along the lower James, *Carex Mitchelliana* M. A. Curtis was a regular inhabitant of the cypress swamps and that *C. hyalinolepis* Steud. was a dominant species of swales, these two species previously not often noted. In the slightly brackish swale near the settlement the northern (Newfoundland and lower St. Lawrence southward) *C. hormathodes* abounded, here at its probable southern limit. At the resort, Burwell's Bay, *Bromus racemosus* (new to Virginia) was among the weeds; the relatively rare *Torilis japonica*, previously found on the shore in Prince George County, was well established; and a colony of Timothy interested us, because of its very slender spikes and smoothish spikelets. It proves to be *Phleum pratense*, var. *nodosum* (L.) Richter, a well known European plant not previously recorded, I think, as established in America.

Aiming to reach the James at a new point, we discovered that by following an old cart-road along the border of a cultivated field we could get to a remarkably undisturbed stretch of shore, with steep wooded slopes, dripping marl-bluffs up to some scores of feet in height, and a broad sandy beach. At the border of the field and along the boundary-fence a purple-tinged weedy *Bromus* was new to us, the infrequent *B. arvensis*, cited by Hitchcock (*Man.*) only from Maryland, there rare. Near-by the woods were monopolized for a good portion of an acre by a continuous mass of *Leucojum aestivum* L., obviously derived from ancient plantings about the now extinct old mansion; and the lady occupying the modern residence told us that in early spring neighboring woods are carpeted with extensive colonies of *Narcissus*. Descending the steep wooded slope, we proceeded

to the dripping, white limy bluffs toward Fort Boykin. In Rhodora, xliii. 654, pl. 695 (1941), I described and illustrated from these and neighboring marl-bluffs the puzzling and very characteristic *Erigeron scaturicola*, the type collected at this station in June, 1941. In fact, the whole slope, wherever there was sufficient stability for vegetation to get a foothold, was a marvel when one thought of it as on the Coastal Plain midway between the Piedmont and the Atlantic shores. The upland continental calcicoles of the region have been sufficiently emphasized in past accounts, but we were still tempted by the largest specimens we had ever encountered of many species: *Elymus virginicus* between three and four feet high, *Solidago arguta* with basal leaves more than a foot long, and *Senecio obovatus* nearly 2 feet high, with rosette-leaves 6 inches long. With these overgrown plants of fertile soils *Zizia aurea*, the first we have found on the lower James, abounded; and there was a meagre representation of the strange variation of it with few rounded leaflets, forma *obtusifolia* (Bissell) Fernald. The *Oxalis europaea*, ordinarily with orange-yellow petals, here had them of a pale lemon-color; and here we found a small representation of *Osmunda Claytoniana*, the common northern and upland Interrupted Fern, the first we have encountered in the tidewater counties. The two great novelties in June, however, besides the *Erigeron*, which we had first noted near Burwell's Bay in late summer of 1940, were very exciting. Typical *Heuchera americana*, as currently understood, is a nearly glabrous plant, with smooth or only remotely hispid petioles and scapes. It and some closely similar variations abound in the richer woodlands of southeastern Virginia. But here, on these dripping bluffs of concentrated lime, the *Heuchera* was gigantic, with panicles up to 1½ feet long, and the petioles and scapes were heavily invested in masses of gland-tipped hairs of varying length. It is a novel plant, to be described and illustrated (plate 721, figs. 2 and 3) in Part II, somewhat simulating the two varieties of the Interior, in Arkansas, Missouri and southern Illinois, southern Indiana and Tennessee. While collecting this strange new *Heuchera* I came upon a single individual of an even stranger *Rubus*, in appearance like a blend of a dewberry and a stiffly upright blackberry, covered with cat's-claw prickles and with very prolonged and stiffly erect soli-

tary axillary pedicels. It was quite unlike any *Rubus* recognized in the Northern States and we spent some time vainly searching for another plant. We obviously were not in its true home, a nearly vertical, wet bluff of lime-marl perhaps 75 feet high, but another season's search in the dry woods and pastures back of the bluffs may reveal it. This doubly unique plant proves to be a new member (PLATE 723) of the remarkable subsection *Anormi* of *Rubus* § *Arguti*, the described species of the subsection being two in Florida, one in Oklahoma. The bluffs of the lower James were maintaining their individuality!

Other points along the James gave us new stations for *Cimicifuga racemosa*, *Euonymus atropurpureus*, *Tilia heterophylla* and other nice things, but our greatest surprise was when our driver took us out to Flowerdew Hundred, near Windmill Point, in Prince George County. Being a friend of the present owners, the Moody family, he did not hesitate, as we should have done, at the closed gates and the "posted" signs along the roads; and the maze of forking country-roads was to him without intricacies. Mrs. Moody kindly allowed us to drive along a planted field to the river. Among the farm-weeds one deserves special note, the tiniest-fruited *Capsella* we had ever seen, a plant which proves to be the European *C. gracilis* Grenier, evidently new to North America. In June of 1941 we were completing the comparisons of freshly flowering *Justicia*, reported on in the last of these Virginia papers. After passing through phenomenally abundant *Ptelea trifoliata* and a new and inland extension of *Bumelia lycioides*, var. *virginiana*, we came to the tidal shore, where *Justicia americana* makes dense carpets. Kneeling to examine its fresh flowers, I suddenly changed my objective. There, amidst the *Justicia* rhizomes, was the little simple-leaved and apetalous, subulate-fruited *Cardamine Longii* Fernald, supposed to be an endemic of tidal shores of Cathance River in Sagadahoc County, Maine. The James River and tiny Cathance River in Maine are 600 miles apart; and here was certainly the reputedly most local member of the genus in eastern America. Chuckling over our new discovery, for here was another of the isolated and ecologically very exclusive estuarine species sharing unglaciated southern Virginia with glaciated southern Maine, another link in the long chain of evidence of relict endemism

within the latter region, we selected nice specimens until nearly dark. Then the obvious thing to do was to try another tidal shore, this time at Jordan Point, up-river, where repeatedly we had combed the vegetation at the river-margin. The previous comb had apparently been too coarse or its manipulation too superficial, for in three minutes we had *Cardamine Longii* there, fine plants in great abundance. Since a specialty of Philadelphia botanists from Conrad and Nuttall to the present generation has been the tidal flora of the Delaware and since Long has particularly devoted his attention to these oozy and slimy flats, it was difficult not to accuse him of negligence in having there overlooked so remarkable a member of the estuarine flora and, especially, his own namesake.

Our duty was clear. The range in Virginia of *Cardamine Longii* must be worked out. So, very promptly, we journeyed to the head of tide on the Chickahominy. There it was, bigger and better than on the James. Then back to our old tidal-flat stations on the Mattaponi, near Horse Landing and King William Courthouse in King William County. *C. Longii* abounded, some plants 1½ feet high, where in August, September and October of preceding years we had crept on hands and knees among the vegetation; and when Mr. Walker gave us permission to explore the flat above his landing at Walkerton, we found it in delightful profusion on the north side of the Mattaponi, in King and Queen. In June we were unable to trail it farther north but later in the year we got it on the Rappahannock. Returning to Philadelphia, Long conscientiously reexplored the proper spots along the Delaware and finally wrote me that it was no use; *C. Longii* is not on the flats of the Delaware. When, however, on our next trip to Virginia, he joined me on the train, one of the first tricks he pulled from his pocket was a long envelope containing the evasive plant from the head of Chesapeake Bay, near the mouth of the Susquehanna.

Desiring, if possible, to find where the lush calcicolous and upland vegetation stops as one goes down the lower James and more definitely reaches Chesapeake Bay, we picked out the bluffs north of Eclipse in Nansemond County, between the mouths of Chuckatuck Creek and Nansemond River. We there were surely beyond the calcicolous flora; and, it being a hot and

breathless day, we struggled through tall and rather ordinary shore-vegetation until we found a good place for siestas. On a cool day the region may prove interesting. At least, at the base of the wooded bluff and back of the beach there is an extensive thicket of a slender and arching but rather wiry blackberry, with remarkably small leaves and glandular pedicels, clearly related to *R. pauxillus* Bailey, a little known Virginia endemic, but much taller, more widely branched and with quite different leaflets (see PLATE 722).

Other localities, mostly already familiar, were visited. These need only brief mention. Rich or bottomland woods along the Nottoway near Huske contained very definite upland *Vitis Baileyana*, now in flower; and near it the *Cornus Amomum* was perplexing because it lacked the usual reddish hairs of the foliage. *Carices* were mostly too old to collect but one colony of plants was an evident hybrid of *C. abscondita* and *C. laxiculmis*, a hybrid we had once before collected, near Hotwater (an appropriate place for such puzzles). Other colonies were as clearly a cross of *C. digitalis* and *C. laxiculmis*, the plant treated by Mackenzie as a good species, *C. copulata* (Bailey) Mackenz. In the argillaceous clearing north of Orion in Greenville County, not far from Readjuster Bridge, there is a big sprangling and long-arching blackberry with jagged-margined leaflets. I have tried to make it something different but it seems to be inseparable from *Rubus recurvans*, one of the common species of Nova Scotia and northern New England, only doubtfully recorded from so far south as Virginia. Carpets of *Panicum* in fine anthesis were very striking on account of their color, one area with the plants blue-green, another with them yellowish. The difference is, apparently, due to different nutrient salts, for morphologically they are both *P. meridionale*, var. *albemarlense*. In this same clearing, which has yielded several notable plants, we had previously collected an extreme of *Carex debilis*, a new variety which I have recently (Rhodora, xliv. 307) described as var. *intercursa*, a plant as yet known only from southeastern Virginia and from eastern North Carolina.

A short visit to bottomlands of the Meherrin, near Gaskins, extended the range of the handsome *Carex Bayardi* Fernald in Rhodora, xliv. 71 (1942) into Greensville County; and here we

also extended southward the range of *Quercus palustris* and got into deeper perplexities than heretofore in *Stachys;* while throughout the trip *Ruellia* proved quite as baffling. The species of the latter genus are not at all satisfactorily worked out. Conscientious collecting in flower and in fruit is necessary before its complexities will be solved.

Furthermore, when we returned to Varina for additional specimens of the *Heuchera* with thin and glabrous leaves subtruncate at base, discussed a year ago and described and illustrated (PLATE 721, FIG. 1) in Part II, we found it accompanied by the characteristic inland variety of *Scutellaria ovalifolia* Pers., the plant described by Short from Kentucky as *S. hirsuta.* Typical *S. ovalifolia*, common in eastern Virginia, is closely pilose with mostly incurved short hairs. Our plant, with long and straight pubescence, is the first from east of West Virginia and Kentucky, except for an old and misidentified specimen from Wytheville, which lies beyond the Blue Ridge. The wooded slope near Varina justifies our original evaluation of it.

If botanical science is the rational subject it is sometimes supposed to be it is obvious that progress should be made along rational lines. In the past some of our best localities in Virginia, the four areas of pine barren, one in Nansemond County, two in Isle of Wight and one in Southampton, and our little sphagnous bog near Dahlia in Greensville County, where *Burmannia biflora* forms a carpet and where *Oxypolis ternata* (Nutt.) Heller and *Zigadenus densus* (Desr.) Fernald have their only Virginian colonies and *Calamovilfa brevipilis* var. *calvipes* Fernald its only known station in the world,—these had all been discovered by sheer good luck or happy chance. The best of the four pine barrens is the extensive one, stretching from slightly below George's Bend on the Blackwater into Gates County, North Carolina. Here, associated with the dominant Catesby's Oak, *Quercus laevis* Walt., Turkey-Oak, *Q. cinerea* Michx., and remnants of the old forest of Long-leaf Pine, there are more specialties than in any of the others, although some are shared with at least one of them: *Sphenopholis filiformis* (Michx.) Vahl, *Rhynchospora pallida* and *R. distans* (Michx.) Vahl, *Tradescantia rosea* var. *graminea* (Small) Anderson & Woodson, *Juncus abortivus* Chapm., *Lilium Catesbaei* var. *Longii* Fernald, *Calo-*

pogon pallidus Chapm., *Zenobia pulverulenta* (Bartr.) Pollard, *Vaccinium crassifolium* Andr., *Pyxidanthera barbulata*, *Eupatorium tortifolium* Chapm., and several others not recognized as Virginians ten years ago. When, in early 1941, the Bureau of Plant Industry in Washington issued the report on the *Soil Survey of Isle of Wight County, Virginia*, following earlier reports on Nansemond and Southampton Counties, our course seemed very clear. The great pine barren of southwestern Nansemond County was definitely designated as "Norfolk sand" and the assumedly authoritative and up-to-date text (dated February, 1941) stated, without a word of qualification, that all the areas of "Norfolk sand" were in primitive and uncultivated condition: "**Norfolk sand.**—Norfolk sand . . . is inherently poor in mineral plant nutrients and organic matter, and none of it is cultivated . . . At present it supports a good stand of second-growth forest" (Soil Surv. Isle of Wight Co., Va. 26, 27). But, as we quickly discovered, dogmatic assertion without the facts is very different from simple demonstration through the actual facts!

Since the Soil Survey maps of Nansemond and Isle of Wight Counties showed approximately 15 areas of "Norfolk sand" which we had never known of, besides the famous one in southwestern Nansemond, our concentrated programme for July, August and September seemed ready made for us. We would use the proper scientific method and consistently visit them all at different seasons, there making the rich harvest of "Norfolk sand" (or pine-barren) specialties which, by the simplest of reasoning, must await us. So, when we started our next period (July 24–August 3), happy once again to be driven by Frank Birdsall, we promptly proceeded southeastward to Isle of Wight and Nansemond Counties. All the distinctive pine barrens known to us being adjacent to the Blackwater River and south of Zuni, the obvious course was to drive north from Zuni toward Raynor and other points near which "Norfolk sand" was indicated in several patches. But, alas, our faith in the Soil Survey, which in the past had received many jolts, was again to be blasted: every area, carefully located by means of the back roads and other features on the map, was now a prospering peanut-field, with no evidence that it had become so only since the

February preceding. Day after day we visited "Norfolk sand," always finding peanut-fields. The prosperous owners of these most productive fields did not realize that in Washington they are officially pronounced to be all "of second-growth forest" and "none . . . cultivated." And when Professor Massey joined us for a couple of days we gave him a vivid demonstration of the type of precision used in preparing the Soil Survey reports for these counties. Northwest of Holland (where there is a branch of the State Experiment Station) the map indicates an elongate patch of "Norfolk sand" with a farm-road bisecting it. Professor Massey was able to verify the farm-road, there running through the middle of a closely cultivated and productive field. Ho-hum! It was really not our fault that our perfectly logical programme had to be abandoned.[1]

[1] We had been perplexed by the very simple mechanical methods indicated in the Soil Survey reports, by which the so-called different soils are often determined, a system based primarily on size and texture of soil-particles. We had also been puzzled to discover no indication of very acute knowledge of the native vegetation, beyond the ubiquitous species which characterize different soils. Such platitudinous phrases as "The vegetation bears a marked relationship to the soils" or "The undergrowth . . . consists of small holly and cedar trees, briers, and native grasses," with no indication of what grasses nor any indication of the occurrence in the acid pine barrens of the three trees (Catesby's Oak, Turkey-Oak and Long-leaf Pine) above noted, with "Juniper", *Chamaecyparis*, in the depressions. There is, furthermore, no recognition of the splendid calcicolous forests on the concentrated lime of the James River escarpment in northern Isle of Wight: Cottonwood, *Populus deltoides*, Hop-Hornbeam, *Ostrya*, northern Red Oak, *Quercus borealis* var. *maxima*, Chestnut Oak, *Q. montana*, Slippery Elm, *Ulmus fulva*, Florida Maple, *Acer floridanum*, various Basswoods, *Tilia heterophylla*, etc., with conspicuous undergrowth of *Hydrangea arborescens*, Moonseed, *Menispermum*, and Climbing Hydrangea, *Decumaria*.

To some extent the pregnant words of the great soil-chemist, Hilgard (whose most helpful understanding of relations of soils and crops as well as native vegetation was started in Mississippi and Louisiana) in 1908 are still important to remember. At that time, writing of a study which demonstrated the marked differences of vegetation on acid, calcareous and magnesian soils, Hilgard said:

"It is refreshing to find . . . a distinct departure from the hackneyed gathering-up of superficial observations on 'plant associations', without any mention of the probable, in many cases abundantly obvious, causes of the geographical grouping of plants. Ecological studies, as often made, savor strongly of the 'gedankenlose Heusammler' habit animadverted upon by Schleiden over half a century ago, and were apparently only temporarily stopped by Darwin's great work. The soil-conditions accompanying the occurrence of certain plant groupings are usually so superficially set forth that nothing but the old classification into hydrophytes, mesophytes and xerophytes is attempted; in conformity with a hypothesis based upon the arbitrary assumption that moisture is the only controlling factor of plant growth. Adding to this hypothesis the factor of soil-texture, and basing thereon the entire work of soil classification, Whitney and the Bureau of Soils of the United States have built up a one-sided theory, which is in flagrant contradiction to facts observable by any one not under the official afflatus of that head center."—E. W. Hilgard in Science, n. s. xxvii. no. 682: 140, 141 (Jan. 21, 1908).

Incidentally, the Bureau of Chemistry and Soils of the United States Department

After, with the collaboration of the federal government, we had wasted precious days and also precious money we had learned our expensive lesson. Disregarding the misleading but official guides to the natural soils, we returned to the old method of exploration, seeking and finding worth-while areas. During the futile search for those 15 patches of "Norfolk sand" which "At present support . . . second-growth forest," we had, naturally, picked up some interesting plants. Somewhat east of Cahoon Pond and north of Suffolk there is an extensive area of peanuts, exactly fitting the pattern and size of a patch of "Norfolk sand" and surrounded by forest, stretching down to Nansemond River. Here the border of the woods is heavily draped by a coarse, subligneous twining legume, in early August showing no flowers but in September loaded with great racemes of royal-purple flowers which scent the atmosphere for some distance away with a concentrated fragrance of Concord grapes. We first collected young branches, in September got flowering material, and in October the absurdly small and thin pilose legumes. The plant is Kudzu-vine, *Pueraria Thunbergiana* (Sieb. & Zucc.) Benth., an eastern Asiatic species often cultivated but here monopolizing the forest-border as a relic of its cultivation long ago, even before the Soil Survey was made. At another "Norfolk sand" station, where, Frank knowing the owner, we were granted permission to search where we would, we spent a most enjoyable hour at the margin of Western Branch (south of Reid's Ferry). To our delight the rare *Ammannia Koehnei*, var. *exauriculata* Fernald here abounded and here was the *Sabatia* of tidal shores, *S. dodecandra*, which we only rarely meet.

Reasoning that the shores of the Rappahannock toward the head of tide might yield some of the tidal-shore species which we knew farther south, we went toward Tappahannock. About noon, stopping to eat lunch in King and Queen County, somewhat north of St. Stephen's Church, we turned up a cart-road at the border of woods. While Long still lingered over tid-bits specially

of Agriculture, which put out the report on the *Soil Survey of Nansemond County, Virginia* (though "In cooperation with the Virginia Agricultural Experiment Station") would have done well to check on its geography. On the map accompanying this report most of Lake Drummond and a large portion of the Great Dismal Swamp, which on Virginia maps regularly appear in Norfolk County, are transferred to Nansemond County. An error of 2 miles of longitude is small, however, beside the other errors of fact above noted.

provided by his devoted housekeeper at home, I poked up the road until I was forced to decide whether to take the left or the right fork. I made a fortunate choice, for I promptly discovered a spring-fed sphagnous pocket in the woods and, after a cold drink, proceeded to untangle the mass of species, always of spring-fed sphagnous woods and always pretty local, including *Eleocharis tortilis* and *Carex Collinsii*. These were mingled with the most gigantic *Juncus subcaudatus* I had ever imagined, with inflorescences 10 inches long. I shouted to Long to come and help, and we soon found that, whenever we took hold of the abundant *Osmunda cinnamomea*, it stuck to our fingers. Search for ordinary *O. cinnamomea* failed to reveal it. The whole sphagnous wood was given over to the somewhat local var. *glandulosa*. We had never before met it in Virginia, nor have we seen it since. This was on one of the tiny rills flowing into Garnett Creek. At the crossing of another such rill near-by we tried our luck again. Here *Scirpus polyphyllus* abounded, the first we had ever seen in the tidewater counties. These sphagnous pockets between the low ridges which separate them will stand further work; but we had started for the Rappahannock and had to leave them for the future.

Aiming to try the shore of the Rappahannock at Ware's Wharf, we turned down-river toward Dunnsville. As we passed the big tidal marshes along Piscataway Creek we stopped to investigate. It was a sweltering day, especially in early afternoon, the marsh vegetation was rank and dense, as well as full of mosquitoes, and, although the spirit was not wholly unwilling the flesh was pretty weak. We decided to leave the Piscataway marshes until a cool day; not, however, before we had collected a good series of the *Polygonum sagittatum* there. It didn't look familiar and, later, when we found it also in the marshes of the Chickahominy, it became clear that these fresh tidal marshes support a tear-thumb which has much narrower leaves, the upper reduced to tiny bracts, and much longer and smoother upper internodes and peduncles than the usual plant. If we can only induce it wholly to abandon its scratchy character botanizing will become more pleasant! On the shore at Ware's Wharf, where, on account of the excessive heat, it was a temptation to lie in the shade of the Wharf, maritime species reach inland

limits on the Rappahannock, *Diplachne maritima, Eleocharis albida, Fimbristylis castanea* and *F. caroliniana* (Lam.) Fernald and *Sabatia stellaris* all abounding. And on the sand there were a few plants of *Portulaca grandiflora*, the first time we had ever met it growing wild.

Hearing in Suffolk that the water of Lake Drummond, in the center of the Great Dismal Swamp, was unusually low, so that patches of shore were exposed, we arranged by telephone with Capt. W. G. Crockett at Wallaceton to take us there in his motor-boat. The trip up the Feeder Ditch from Wallaceton to the federal dam which controls the level of Washington Canal, by letting in water from Lake Drummond when needed, is wonderfully picturesque, especially toward twilight when the dense bordering forest is vividly reflected in the quiet black water; and, once introduced to it and to Capt. Crockett's kindly good nature, rare knowledge of the plants and animals, and wonderful fund of unbelievable but plausible tales, the trip to Lake Drummond promptly became one of the pleasures regularly to anticipate. After being duly introduced to and registered by the engineers, especially Mr. Cherry, at the dam, Long and I walked up the path to the outlet, there to be met by Capt. Crockett. It was obviously too early for most lake-shore vegetation, but in the rich and dark woods, where it would be most simple to get turned around and lost, *Dryopteris celsa*, at its type locality, abounded; and the variations of *D. spinulosa* and its var. *intermedia* were super-abundant and hopelessly perplexing. Anyone, if he still exists, who imagines that these are distinct species should study the confluent series about Lake Drummond. It can be sorted only by counting the glands under a microscope and then the sorting is quite artificial. At the entrance to the Feeder and again near Portsmouth Ditch *Lachnanthes tinctoria* abounds, this being the only surely indigenous station for it in Virginia. The plants are larger than we were used to farther north, nearly three feet high and with corymbs up to six inches broad; and we imagined that the perianth was yellower, but study of a large series fails to reveal any significant differences. The recently described *Rhynchospora chalarocephala* Fernald & Gale in Rhodora, xlii. 426 (1940), for which only one station was definitely known in Virginia, abounds on the shores

of Lake Drummond, there particularly large and handsome; and we were here impressed by the very bristly sheaths of the *Sacciolepis.* Ordinarily *S. striata* is glabrous. The Lake Drummond plant proves to be *S. gibba* (Ell.) Nash, based upon *Panicum gibbum* of Elliott. It will be considered in Part II.

More than a century ago the erratic and too often irresponsible Rafinesque published as *Macuillamia obovata* a mixture of plants from Louisiana and from shores of the Potomac. His name, obviously based on a mixture and not identifiable by any specimens known to exist, had properly gone into the discard. But in 1935 Pennell, "leaning over backward" to do no possible injustice to the dubious memory of the author and to retrieve his name, took up *Macuillamia obovata* for a unique plant found by the late Earl J. Grimes on the shore of the Chickahominy (not on the Potomac) and, considering the species to belong in the not too inclusive *Bacopa,* I later stupidly (for I had not seen it) made the formal transfer of it, as *Bacopa obovata* (Raf.) Fernald. The only known material which had been referred to the Potomac half of Rafinesque's mixed *Macuillamia obovata* was a rather meagre series of 3 somewhat broken plants said by Pennell to have been collected by Grimes at Lanexa. Since, however, the label accompanying the specimens bears the name *Echinodorus tenellus,* belonging to a tiny acaulescent linear-leaved plant of the *Alismaceae* with umbels terminating naked scapes, a plant not known in Virginia, and since the Grimes specimens are clearly of a *Bacopa* (*Scrophulariaceae*), with rounded-obovate opposite leaves with axillary flowers borne along the ascending stems, there was obviously as much confusion about it as in Rafinesque's original publication. Repeatedly we had driven to Lanexa and there had crept along the tidal shores at every probable spot for a mile or more up- and down-river. The only *Bacopa* there is the smaller-leaved species forming prostrate mats, an undescribed and very characteristic inhabitant of the tidal shores of the Chickahominy and the Mattaponi, equally interesting as a new and localized species (PLATE 728) but surely not the Grimes plant. In view of the great abundance of the matted plant at Lanexa and generally along the Chickahominy for many miles, it is astounding that Grimes did not collect it. Still dissatisfied because of our failure to locate the rare species

which he presumably *had* collected somewhere and which had so obviously been associated with the wrong label, we decided to cruise in motor-boat along the Chickahominy from the head of tide, below Providence Forge, to the big curve of the river below Lanexa, a distance, as the river meanders, of more than 12 miles along each shore, making approximately 25 miles, besides the inlets, of tidal shore to be investigated. That was some proposition, for every bit of open shore exposed at low tide, at the entrances of seepage-rills or near landings, where the ubiquitous thicket of erect and dominating *Nuphar advena*, with its associates of the extensive marshes, had not obliterated everything else, must be investigated.

Returning to our friend, Mr. W. T. Walls, on the shore of the Chickahominy near Windsor Shades, we secured a boat with out-board motor. While Mr. Walls was getting everything ready for our start, we browsed along the marshy shore near his landing, promptly finding a mixed and not too quickly distinguished colony of *Lindernia dubia*, var. *inundata* Pennell and *Gratiola virginiana*, var. *aestuariorum* Pennell, the latter cited by its author only from Salisbury, Maryland, and from the Delaware in New Jersey. Circling about the islands in the river, we skirted the southern shore (in Charles City County) only a short distance, only to Cypress Bank Landing, for the collecting was very absorbing. The prostrate small-leaved and undescribed *Bacopa* made almost continuous carpets, more and more exposed as the tide went out; and from amongst these mats we quickly extracted *Peplis diandra* of the Mississippi Basin, discussed in the last paper on our Virginia work, *Potamogeton Spirillus*, its range extended into a new county, *Sagittaria Eatoni*, the problematic plant of tidal mud from the lower Merrimac to the Delaware, new to Virginia, *Cardamine Longii* of course, and *Micranthemum micranthemoides*, the first from south of the Potomac at Alexandria, and, inevitably, the very baffling series of tidal-flat *Najas*. The careful collecting of these muddy and silt- and alga-covered plants in a habitat where the water promptly became dark and opaque after each grab from the bottom, is time-consuming and back-breaking and, as stated, we barely reached Cypress Bank Landing on the first day.

It was necessary to return for low tide on two succeeding days,

not only for better material of some of these species but in order to reach Lanexa. The unusually dry cypress swamp at Cypress Bank Landing has some nice undergrowth but only two species there need detain us from the greatest prizes in late July along the Chickahominy. Here was *Styrax americana*, one of the rarest and most beautiful shrubs or small trees of Virginia, and the *Elymus virginicus* here was obviously var. *jejunus* (Ramaley) Bush, a distinct little extreme, not previously known in the Atlantic states from south of New Jersey. The greatest necessity to return to the Chickahominy, however, was the suddenly discovered problem in *Nuphar*. The broad and nearly impenetrable marginal marshes of the Chickahominy are an almost solid thicket of *Nuphar advena*, standing erect, and interspersed, where there is a root-hold, with *Zizania aquatica, Aeschynomene virginiana, Kosteletzkia virginica, Boltonia asteroides* var. *glastifolia* (Hill) Fernald, either white or pink, and other tall species which can stand the crowding. When we left the immediate tidal shore of the Chickahominy we found ourselves in a maze of *Nuphar*, with floating leaves much narrower than the erect ones of *N. advena*, the plants bearing beautiful masses of filmy submersed foliage. In mid-current the narrow and elongate leaves were obviously those of the famously localized *N. sagittifolium* (PLATE 718), reputed to grow only in the Lower Cape Fear river and adjacent tidal rivers of southeastern North Carolina and northeastern South Carolina. That much was clear; the familiar "first known from north of southeastern North Carolina" applied even to the mid-current *Nuphar* of the Chickahominy. Our difficulty was with the floating-leaved plant (PLATE 719) which everywhere formed a broad belt between the mid-stream *N. sagittifolium* and the open-marsh *N. advena*. This plant, with floating and submersed leaves broader than in the former, with the "floaters" much narrower than in the latter, which is supposed not to have filmy submersed blades, abounded for many miles down-stream as well as up some of the entering creeks. Repeated study of it in the field and subsequent study in the herbarium indicate that it is a well defined hybrid-species, comparable with the northern *N. rubrodiscum*, which is often associated with its very distinct parents, *N. microphyllum* and *N. variegatum*. Even though we had not yet found Grimes's

problematic *Bacopa*, the Chickahominy had more than justified our visits to it.

Grimes had reported *Sarracenia purpurea* from "Swampy woods, at Chisel's Run, near Williamsburg-Centerville Road"; and since *Sarracenia* is an index-species to a habitat where interesting associates may occur, we sought out Chisel's Run. Where it crosses the road it was, at this season, dried out and we could not locate the *Sarracenia.* The plant which immediately challenged our attention was, instead, a rather small *Nuphar*, with roundish, erect leaves and with the fruiting peduncles arched into the mud. This plant somewhat baffled us and, starting early next day, we crossed and recrossed Chisel's Run at several places, locating new colonies of the *Nuphar*, always small-leaved and erect, until finally, just east of Centerville, a small and very muddy pondhole proved to be its real home. At the margin of the pond the leaves were erect and rather large, inseparable from those of *N. advena* of the tidal marshes; but farther out, in deeper water, the firm blades were floating. Best of all, young plants in deep water had filmy basal foliage, in shape like the emersed leaves. The flowers and fruits are those of *N. advena* and it was evident that, in this quiet and hardly fluctuating water, we were getting the submersed foliage of that species (PLATE 717), which in estuaries does not produce them.

Having a few hours left, we decided to investigate flat Mulberry Island, a great and almost contourless expanse on the north side of the James, with many tidal creeks. Passing Lee Hall and approaching the "Old Earthwords" of the map, we found ourselves at Fort Eustis, a very much alive military post. It proved that Mulberry Island was in use throughout the week for bombing-practice and would be a most unhealthy place for botanists. Incidentally, we could visit it only on a Sunday and then by special permit. In view of the intensified activity since December of 1941 Mulberry Island will remain a botanical *terra* (if not *terror*) *incognita* for some time to come. Attracted by the crowded contours and steep slopes to the James west of Carter's Grove and southeast of Grove Station, we started for Grove Landing and adjacent Martin's Beach. Very soon we were in the richest of hardwood forest, growing on the Miocene fossil beds of calcareous marl and shells. Collecting as rapidly

as possible, for it was becoming late, we were promptly impressed by the *Hypericum punctatum*, for here, instead of oblong and round-based leaves, it had them narrowly oblanceolate or spatulate. We had noticed it before but here it abounded, the extreme form which Bicknell had separated as *H. subpetiolatum*. In the woods *Taenidia integerrima* abounded, an inland and upland calcicolous species not seen by Grimes and never before found by us on the Coastal Plain. Similarly, *Triosteum perfoliatum* was new to our Coastal Plain experience. The forest from well back in the ravines to the bases of the bluffs was very striking with the whitish-gray trunks of *Acer floridanum* (Chapm.) Pax (PLATE 725).

It was evident that another half-day was needed for such a rich locality. So, returning next day, we at once became involved with *Acer*. Three series of trees abounded, some past fruiting, others in full fruit, and the late-fruiting trees differed from the others in many characters. We collected from a dozen different trees and when, in April of this year, we returned with my two former students, Dr. Ernst C. Abbe of the University of Minnesota and Dr. Albert L. Delisle of William and Mary, we got a fine series of flowering specimens, these later supplemented by fruiting material kindly gathered for me by Delisle. In brief, there are three quite distinct series of *Acer* and some evident transitions between them on the calcareous slopes near Grove Landing. One is a relatively small tree with smooth but finally furrowed whitish bark, the trunks up to 2½ feet in diameter. This tree has slender and glabrous or usually glabrous new branchlets; tiny flowers, the pistillate or perfect ones with the short style included; the small leaves, in size and form suggesting those of *A. campestre*, pale and minutely tomentulose-pilose on the veins beneath or glabrate; the small fruits promptly falling (often all dropped in June). This is an exact match for *A. floridanum* (Chapm.) Pax, a species (PLATE 725, FIGS. 1 and 2) already well known to extend into southeastern Virginia. The others in good development are very different: magnificent trees (PLATES 726 and 727, FIGS. 1 and 2) with whitish trunks up to 4 feet or more in diameter, the old bark exfoliating in long shingles, so that old trunks suggest shag-bark hickory; the flowers larger than those of *A. floridanum*, the styles long-

exserted; the leaves as large as in the northern and upland *A. saccharum*, of two quite distinct forms, both deeply lobed and, like the young branchlets and petioles, heavily covered beneath with a dense whitish to brown felt or velvet; the fruits larger than in *A. floridanum.* Although a few trees are evident transitions between the two extremes, the shag-barked maples are certainly not typical *A. floridanum.* Neither are they the shrubby or barely arborescent and more southern *A. leucoderme* Small, the only other eastern white-barked species. They seem to stand to *A. floridanum* in much the relation of var. *nigrum* to *A. saccharum;* they will be further discussed and illustrated (PLATE 726 and 727, FIGS. 1 and 2) in Part II, where I shall take great satisfaction in permanently associating with them the name of my companion, Long, who has done so much to discover the rarer plants of southeastern Virginia.

A couple of remarkable and herefore undescribed "Sugartrees" would have been a fitting climax to a trip which began as an absolute "flop"; but we had to get back to the Meherrin, near Gaskins in Greensville County, for mature material of the puzzling *Stachys* which abounds on the wooded bottomland there. Consequently, we devoted out last day, before returning home, to the Meherrin. Starting on the farm-road toward the river, we soon got out and walked, for many interesting species demanded attention. The beautiful pink-flowered *Sabatia* was real *S. companulata* var. *gracilis,* the first satisfactory material we had seen in the state, earlier collections being too transitional to *S. campanulata.* A single plant of a *Crotalaria* excited us, for it was like oblong-leaved material we had once got on the Eastern Shore, about the identity of which we had never been happy. It proves to be *C. sagittalis* var. *oblonga*, described by Michaux in 1803 and not subsequently recognized, a plant represented in the Gray Herbarium by no other material from north of Florida. The border of a cultivated field gave us one fine species which we had never before seen in the state, the handsome *Cassia Tora*, a splendid tropical plant. Thus, our last day out was far more productive than the wasted first days and, having got into real stride, we regretted having to quit while discoveries, some of them of tremendous interest, were the daily reward for our effort.

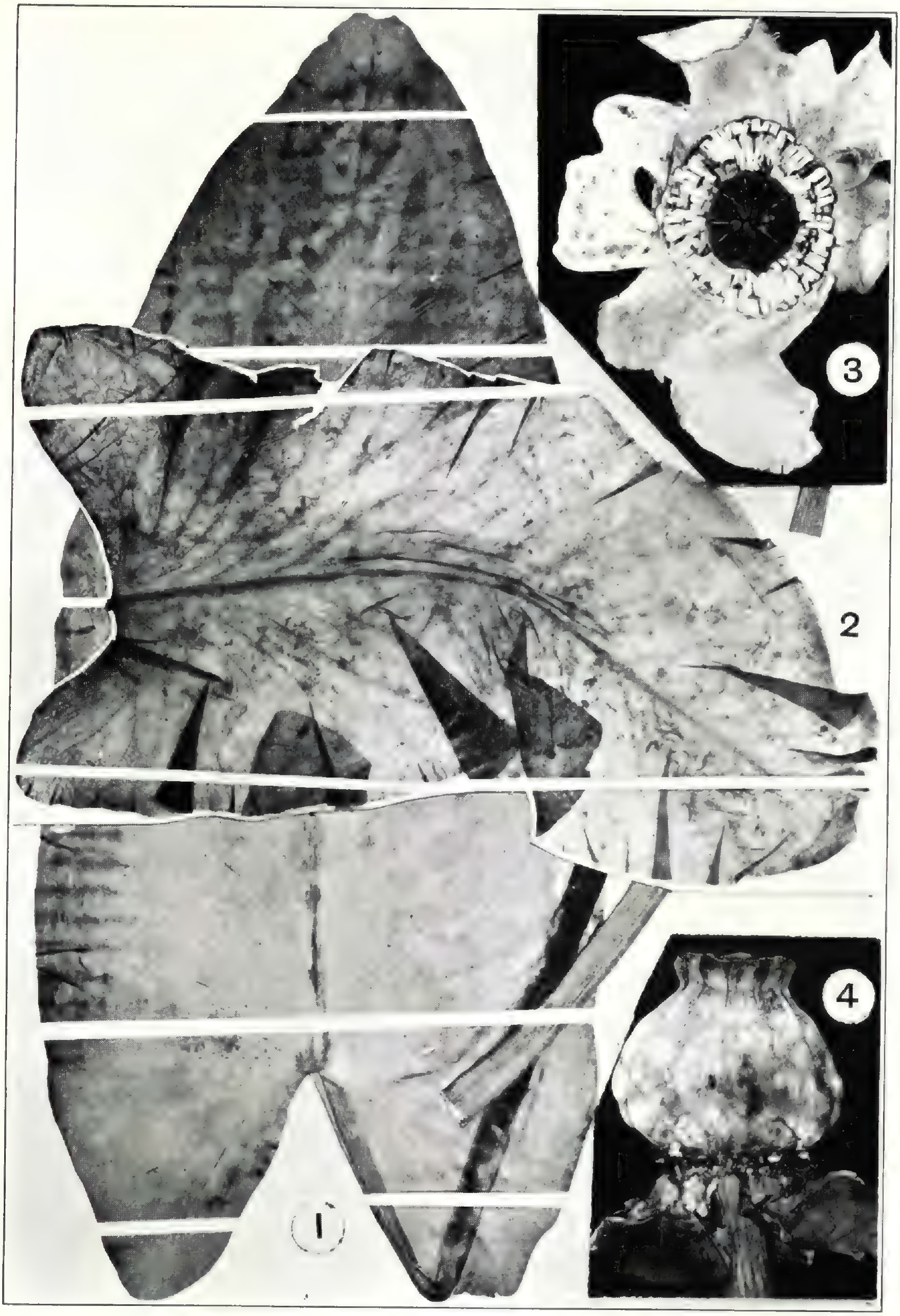

Photo. B. G. Schubert.

× NUPHAR INTERFLUITANS: FIG. 1, floating leaf; FIG. 2, submersed leaf; FIG. 3, flower, laid open; FIG. 4, fruit; all × 1.

Photo. B. G. Schubert.

Aconitum uncinatum, fig. 1; var. acutidens. figs. 2–4; all × 1.

When we returned in September (5–15) Frank's school was beginning, our other fine drivers and companions of the past were all away or in military service and, except for those happy days when Orion Birdsall could take a day off to go with us, we were at the mercy of as poor a substitute as could be imagined. Our regular or, rather, irregular driver was so irresponsible and unreliable that we never knew, until he arrived, whether we should get away for a full day's trip. Thus handicapped, the inevitable result of having all high-grade young men in the government service or at other important employments, we actually made a good score of discoveries, because we were in a region of seemingly endless possibilities, even under adverse conditions. Returning to the James River escarpment in northern Isle of Wight County, we found below Fort Boykin a patch of very large plants of *Physalis barbadensis* Jacq., a tropical American species we had not before encountered; but the strangest plant for its habitat here was about the hydraulic ram which pumped water for a hotel. The overflow from the pump made a perpetually replenished pool in the woods and in this pool, under heavy splashing of cold, fresh (probably calcareous) water, *Zannichellia palustris* var. *major* abounded, a plant more generally found in quiet, brackish to saline waters.

Returning to the steep marly bluffs above old Fort Boykin, we found the cultivated field, by which we passed in approaching the river, with one conspicuous weed, a villous-hirsute Malvaceous plant with somewhat angulate-lobed leaves, flowers with blue-violet petals shorter than the calyx-lobes, and radiating, long-awned carpels. It was wholly strange to us and not in Small's *Manual.* Search shows it to be a puzzling member of the tropical and subtropical genus *Anoda.* I can not exactly match the plant, which belongs to the polymorphic series of Texas, Mexico and South America and all called, until the genus is properly monographed, *A. cristata* (L.) Schlecht. In fields along the James it is pretty far from home, assuming that it can be matched and has a home. Then, in following the path down the wooded slope to the river-beach, we got the large-leaved *Satureja Calamintha* (L.) Scheele, var. *nepetoides* (Jordan) Briquet, a well marked variation of the common *S. Calamintha* (*S. Nepeta*) and not heretofore recorded from America. How these two

weeds, the first apparently from South America, the second European, got into this corner, remote from railroads and much outside intercourse, is a problem, one which suggests the question of the local origin of the commonest representative of *Chenopodium ambrosioides* in southeastern Virginia, a villous, instead of glabrous, plant abounding in waste land, which proves to be the South American var. *chilense* (Schrad.) Spegaz., to be discussed in Part II. To this group of South American weeds, naturalized in southeastern Virginia (in this case also in eastern North Carolina), belongs "Muster John Henry", *Tagetes minuta* L., noted in Rhodora, xxxix. 459 (1937). That, however, is raised in many yards of the colored population as an aromatic herb.

The native plants of the marly bluffs have already been sufficiently noted, but on the beach of the James *Gaura biennis* reaches its probable eastern limit in the state, and here we found a single individual of *Cuphea petiolata*, obviously a waif from some station we do not yet know. One plant of the bluffs, however, should be specially noted, *Campanula americana* with the flowers all tubular and cleistogamous. Typically *C. americana* has the coralla rotate and deeply cleft into prolonged lobes; and upon these characters has been set up the *micro* (Small)-genus *Campanulastrum* Small. The aberrant plant with the corolla more tubular than in most true *Campanula* seriously shakes one's faith, if he has any, in the generic stability of *Campanulastrum*.

Earlier in the year we had seen a strange prostrate *Desmodium* in rich calcareous hard woods west of Chippokes. It now seemed the right season for it to be fruiting; and it surely was fruiting, the loments quite strange to us. Only two or three lingering flowers could be secured, these milk-white; but these belong, Dr. Schubert assures me, to the very rare *D. ochroleucum*. In Rhodora, xli. 546 (1939) I recorded the latter species from a wholly different habitat, dry and hopelessly sterile siliceous and acid woodland of *Pinus virginiana* in Caroline County, where Long and I could have collected many thousands of sheets. That plant had the petals cream-colored, quickly changing to yellow, and, although we then called it *D. ochroleucum*, Dr. Schubert shows me that in stipules and other characters it surely is not that species.

The calcareous woods and ravines sloping to the James below Claremont Wharf and, some miles away, above Claremont have yielded so many choice or rare species that we decided to try the shores and slopes immediately above the Wharf. We had looked there earlier in the season and when we went there in September we were happy to have Massey with us. The great series of calcicolous woodland species already recorded from the Clarement region need not be again enumerated, but some now found were new to us. Turning into an old station in order to show Massey our colonies there of *Hybanthus concolor*, *Athyrium thelypterioides*, *Dryopteris celsa*, etc., we walked into a fine colony of *Scrophularia marilandica*, new to the Surry County list. On the beach a clump of *Aster pilosus* Willd., var. *demotus* Blake held its old involucres of the preceding year and its new flowering branches arose from the axils of the preceding autumn. The herbaceous genus *Aster* is difficult enough; if it is to enter the group of shrubs we may be able to turn it over to those who somehow still think that trees and shrubs are taxonomically the property of specialists who never look at herbs. In the woods and thickets back of the beach and in wooded ravines *Eupatorium rugosum* Houtt. (*E. urticaefolium*) did not look right. Its leaves were rather small, harshly scabrous and often cordate and the involucres of the few flowering heads did not seem typical. It was promptly noted for observation a month later.

While Massey was with us we had no difficulty in inducing him to make the trip to Lake Drummond. We had already been to the Lake a week or so earlier but there were many strips of shore still awaiting attention. The two visits, chronologically so near together, may be treated as one. To us it was very sad to see much of the eastern half of the Great Dismal Swamp still smouldering and smoking. Whenever we had been there fire was working unchecked and, it seemed to us, so taken for granted that the destruction of forest and originally deep humus goes on as a matter of course. When, in April of this year, Capt. Crockett took us, with Dr. Abbe, in to Lake Drummond fire still burned, without evident protest, close to the government Feeder Ditch. Nearly 70 years ago the late J. W. Chickering wrote of the region of the Great Dismal Swamp reached from Norfolk, "Most of the large trees . . . have fallen victim to the

frequent fires, several of which were raging during our visit, and lighted up the horizon at night; often by these fires the peaty soil for miles is burned to the depth of four or five feet; the hollow thus formed soon fills with water, and ever after retains a truly 'dismal' appearance."[1] That was 69 years ago. We gather from the newspapers and journals that we have advanced in our appreciation of our natural resources; it makes pleasant reading but if anyone, civilian or official, makes any serious effort to save from complete and wasteful ruin some remnant of the great forest and the deep soil of the eastern half of this unique, sentimentally significant, and economically once important area, we have not noticed it. The Feeder Ditch, tributary to the federal Washington Canal, is under government management. While the great feeder-dam is scrupulously maintained, guarded by military police, and its water conserved, the forest near-by is being wasted and laid bare. For that no one seems to "give a dam[n]". Yet we sometimes hear of so-called "conservation," which in this country often means killing out the rare native plants and then planting foreign crops to attract game-birds, in order that "conserving" man may destroy them. What a farce! When all the old trees and all the humus are burned out and the resultant ash has become covered with a rank growth of weeds, the Great Dismal Swamp will be a candidate for "preservation" as a National Forest.

But the living remnant of the original flora still has some interesting species. It was good to collect fine material of *Psilocarya scirpoides* var. *Grimesii* Fernald & Griscom at its type-station, where Grimes had got it 20 years before, and to verify the reported occurrence of *Eriophorum virginicum* in the Dismal Swamp. Grimes and, before him, the late J. Arthur Harris had got *Xyris fimbriata*, not recorded from the state, in some abundance; the best Long and I could do on our first trip of the month was to find a solitary individual among the superabundant *X. caroliniana* and *X. difformis*. Typical *Rhynchospora macrostachya*, at its only known locality in the state,

[1] J. W. Chickering, *The Flora of the Dismal Swamp*, Am. Nat. vii. 521–524 (1873). Unfortunately it is not possible for those who know the region to accept some of Prof. Chickering's identifications. His statement that "The great laurel (*Rhododendron maximum*), and perhaps loblolly bay (*Gordonia Lasianthus*), are very abundant" should have had all the emphasis on "perhaps" or rather *probably not;* and surely there was serious error in recording *Myrica Gale*.

mingled with *Lachnanthes* and *R. chalarocephala;* and on one stretch of shore, near Jericho Ditch, *Sagittaria Engelmanniana* (the broad-leaved forma *dilatata*) abounded. Although not definitely reported from south of Delaware it is, on Lake Drummond, really at an intermediate station, for, as noted in Part II, it has been collected as far south as South Carolina.

Lake Drummond was so phenomenally low that it had been difficult to navigate, on account of drowned cypress-knees, and it was, consequently, necessary to anchor hundreds of yards from the thicket and to wade, often slipping on submerged logs, to shore. At one point on the southeastern side, where we saw a vivid green carpet of low vegetation, Long and I struggled ashore, guiding ourselves by means of oars as sounding-rods and sinking each step well above our knees into the plastic clay of the bottom. Even after we got to the green carpet the clay, above low-water level, was so pasty and deep that we wallowed and tumbled with great ease but kept enough poise and breath to collect only with extreme difficulty. Pulling and grabbing as best we could we brought back to the boat a miscellany of specimens and, after it was too late, we discovered that the *Sagittaria* of this deep mud had peculiar bracts and strongly compressed pedicels; furthermore it evidently has prolonged subterranean rhizomes. The material is rather inadequate and we needed more conclusive specimens. Unfortunately, however, when, in October, we tried to get to Lake Drummond for it, the Feeder was closed to navigation on account of repairs going on. The *Sagittaria* is one of many problems left for the future.

On seeping shores near Jericho Ditch and in the Ditch itself *Limnobium Spongia* abounds, sterile and very large in the Ditch, fertile, freely flowering and fruiting on the shore. We always turn in at Jericho Ditch for a drink of cold water. Fed by subterranean springs, Lake Drummond supplies potable water the color of strong tea ("Juniper water"), though after a hot summer pretty warm, but Jericho Ditch has delightfully cold water. We were glad, as we had never been before, to drink freely from a "ditch." Near here the woods yielded *Ilex coriacea,* known to Capt. Crockett as Sweet Gallberry, the fruits, becoming soft and pulpy in autumn, said by him to be palatable, as contrasted with the hard and persistent ones of Bitter Gallberry, *Ilex glabra.*

And at the western side of the Lake, in Nansemond County, we wandered in an extensive forest of large trees of *Persea palustris*, loaded with such masses of bluish-black fruit as we had never imagined, some trees with the prescribed pubescent foliage, others but sterile ones with the leaves glabrous. We already knew the glabrous-leaved form from other areas in the county. It seems not to have been described, for botanists of the past have evidently mistaken it for the quite different glabrous-leaved *P. Borbonia*. *Persea* is primarily tropical, formerly extending northward on the Coastal Plain only locally to southern Delaware. It was, therefore, a bit disconcerting to walk under its shade through abundant *Dryopteris spinulosa*, inseparable, so far as we could see, from the fern of Canadian and European forests. What sort of ecological "association" is this?

Eupatorium was developing, far enough along for recognition. One species, however, was not recognized in the field by us. We had already got it in thickets near Wallaceton, and on the shore of Lake Drummond it abounded. It proves to be *E. recurvans* Small, the first from north of Georgia. Another, a plant we had often collected, had jagged-toothed leaves. It belongs in the polymorphic series typified by *E. hyssopifolium*. We had been perplexedly collecting these plants since we first went to Virginia. In Part II I shall try to elucidate them, including two varieties (PLATE 737) not previously recognized from Virginia and a new species (PLATE 738), apparently endemic. Lake Drummond had well repaid our two visits. Outside, north of Wallaceton, we stopped on our second visit for more mature material of a *Bidens*, unlike any we had recognized in the state, but still needing mature fruit for its identification.

Returning from Norfolk County, we noticed that the broad bottomlands of the Blackwater, usually drowned, were dry enough for easy traveling. So we spent a very exceptional hour on the bottoms southeast of Ivor. The great prize was an extensive colony of *Cynoctonum Mitreola*, in aspect very like a Borage with white flowers, but promptly distinguished by its opposite and stipulate leaves and by the fruit. Other bottomlands, too, gave us some nice things. Returning to the Nottoway east of Huske we found our tangle of *Vitis Baileyana* in ripe fruit, the grapes blue with a bloom and pleasantly sweet.

V. vulpina (*V. cordifolia*), which it slightly resembles, would not be ripe for some weeks yet and no one would eat its black fruit for sweetness or for pleasure. On the bottomland of the Nottoway near Green Church Bridge we were delighted to find an extensive area of *Erianthus brevibarbis*, a rare species for which we had only one previous station, that in constant danger of extinction. Similarly, on the bottomland of Three Creek at Drewryville, where we always find something worth while, *Micranthemum umbrosum* (Walt.) Blake, which we had found there as immature plants in 1936, was now finely flowering, the broad, creeping mats suggesting tiny *Lysimachia Nummularia;* and with it were fine colonies of *Paspalum fluitans* (Ell.) Kunth, a species for which our stations are few. In the depressions where water stood the *Diodia* puzzled us. It proves to be an undescribed and quite characteristic extreme of *D. virginiana* with distinctive characters in both leaves and fruit.

While collecting beautifully flowering and very tall plants at the border of dry woods near Orion of the recently described *Sida inflexa* Fernald, new to Greensville County, we were impressed by the firm and strongly scabrous foliage of *Phaseolus polystachios*, growing with it. It had more than once so impressed us in past seasons, the leaflets relatively stiff, harsh and withstanding heat, whereas the plant of Pennsylvania, New Jersey, New York and southern New England wilts upon being picked and its thin leaflets are smooth above. In October, when we got it in fine fruit, it was clear that the beans differed in shape, size and color from those of the more northern plant.

Earlier in the summer we had seen at the border of woods in Adams Swamp, south of Baines Hill School in Nansemond County, an exceedingly villous and leafy *Elephantopus* which puzzled us. It was now time to go for mature material. The plant proves to be a marked extreme of *E. carolinianus*, one we have seen nowhere else.[1] In wet woods in the swamp there

[1] We thus added another to the Virginian series of Elephants and their feet. We already had the Bare-footed Elephant (*Elephantopus nudatus*), the Hairy-toed Elephant (*E. tomentosus*), the Stub-toed Hairy-toed Elephant (*E. tomentosus*, forma *rotundatus*), the Carolina Elephant's-foot (*E. carolinianus*). We were adding the Wooly-socked Carolina Elephant's-foot! These names, like "Foul-scented Lovegrass" and others in Britton and Brown and many of the crudely formed absurdities in the new "Standardized" Plant Names, are not colloquially used. Ours are intended as jokes; the others, unfortunately, were not. It is often said, however, that the greatest jokes are unintentional.

were extensive areas given over to the long-arching and often tip-rooting, very soft-hairy *Ludwigia pilosa* Walt., which we had known only once before in Virginia, in mossy pineland south of Grassfield in Norfolk County. There the plants are low and rather small. Here they were tremendous, and their creeping basal offshoots were prolonged. On the way back to Suffolk from Adams Swamp we suddenly saw in the roadside ditch bordering low woods a *Coreopsis* with much broader basal leaves and much shorter ligules than in the frequent *C. oniscicarpa* Fernald. Its involucre also showed marked differences and it was evident that we were adding another *Coreopsis* to the flora of the state. It would be necessary to return in October for fruit.

September visits to the tidal shores of the Chickahominy yielded more adequate material of *Micranthemum micranthemoides*, *Sagittaria Eatoni*, the carpet-forming *Bacopa* and, of course, *Nuphar*. *Hypericum mutilum* var. *latisepalum* Fernald, which we had known north of Florida only on tidal shores of the Mattaponi and the Pamunkey, was abundant; and a slender *Strophostyles*, somewhat like *S. umbellata* but quite glabrous, abounded in the wettest of tidal marsh. Fruit secured in October shows it to be an estuarine variety of that species of dry soils. Best of all, we finally got the mysterious *Bacopa* (PLATE 729) about which Grimes's reputed label is so contradictory. Only three poor pieces of it have previously been known, their true source wholly vague, and their identity evidently misinterpreted. We now have a good series which forms the type of a second species of the genus to be described and illustrated (PLATE 729) in Part II.

No trip to southeastern Virginia could be made under happier circumstances than our next brief visit (October 10–17), for we had delightful weather, the red-bugs were gone, frosts had been delayed, except in the Dismal Swamp and other extensive low areas, and, best of all, Dr. Donovan Correll, at home in North Carolina for his vacation, readily accepted our invitation to drive us to old and to several new stations. Our only regret was that Mrs. Correll, whose acuteness as a field-botanist we well knew, could not be with us. Time was short and we wanted to get at many areas, the Rappahannock at the north, the Carolina border at the south. I had written from Cambridge, arranging with Capt. Crockett to take us back to the pasty-clay

shore of Lake Drummond for the perplexing *Sagittaria*. Unfortunately, however, when we reached Wallaceton the Feeder Ditch had been temporarily closed to navigation. We, consequently, started for Northwest River to the eastward. Coming to a wooded swamp near Gertie, which seemed attractive, we stopped to look it over. The only real novelty, however, was an abundant small oak in the dry woods above the swamp, with the lower leaves of the branches like those of *Quercus Phellos*, the terminal ones broadened from prolonged wedge-shaped bases to deeply 3-lobed obovate summits. This proves to be the very rare *Q. nigra*, var. *tridentifera* Sargent. We incline to the interpretation that its rarity is due to its probably being a hybrid of *Q. nigra* and *Q. Phellos*.

Aiming to cross the upper Northwest River by the bridges shown on the old map, we succeeded in finding our way to one bridge and on the broad bottomland southeast of Cornland found *Panicum hemitomon*, a local species in Virginia, very luxuriant. Then we got lost but eventually brought up at Northwest. One plant, detected on the way, is well worth a note. On the second day in this region, after passing Cedarville and driving toward Land of Promise, we saw a tall and loosely ascending *Aster* with very long and slender spiciform racemes of tiny lavender-rayed heads, somewhat suggesting *A. vimineus* but too stiff and scabrous and with the phyllaries inclined to be subulate-tipped. It proves to be the rare *A. racemosus* Ell., heretofore known only from Florida to eastern Texas, north into extreme southeastern South Carolina. We always expected something from the neighborhood of Land of Promise; now we were getting it.

The first afternoon at Northwest we spent chiefly on the reed-marsh near the bridge, where the tide is sufficient regularly to change the water-level. This was an old locality of Heller and of Kearney. We consequently got little which they have not recorded. These marshes are the type-locality of the superb *Lobelia elongata* Small, with large azure-blue flowers in racemes up to a foot long, and we were glad to secure good specimens, some of them strongly forking. *Cladium mariscoides*, apparently not recorded from the state, abounds, as does *Rhynchospora macrostachya* var. *colpophila* Fernald & Gale, the estuarine ex-

treme which we had not seen from south of the James. The blunt- and small-leaved *Lyonia ligustrina* var. *foliosiflora* also abounded, the true southern shrub of such habitats, new to Virginia, the acute-leaved and usually taller Virginian shrub which has erroneously passed for it being var. *salicifolia* (Wats.) DC., as pointed out by me in Rhodora, xliii. 625 (1941). A sphagnous pocket gave us *Eriocaulon decangulare*, *Sabatia dodecandra* and some other species which, with them, were recorded by Kearney or by Heller. Seeing a corduroy road through the woods of the bottomland, we followed that. We vainly looked for fancy southern shrubs but everything at this season seemed familiar, although it is a promising habitat for something new to us. The most striking plants, perhaps, were two: *Limnobium Spongia* in solid carpets and the now quite familiar *Rhynchospora caduca* Ell., here just coming into flower in mid-October, doubtless because the woods had only recently emerged from continuous flooding.

Moving on to Blackwater River (tributary to the North Landing River), Long and I were fighting our way through *Typha truxillensis* HBK. and other towering plants of the reed-marsh there with our hands full of very tall *Ludwigia alata*, from its second station in the state, when Correll called, "What is this *Aster*?" We had seen no *Aster* but very soon we were in a large colony of a coarse and rather handsome species strange to us, with subcylindric, broad inflorescences of large flesh-pink heads. It proves to be the rare southeastern *A. Elliottii* Torr. & Gray, new to Virginia—so rare that, until our material was inserted, there were scarcely six sheets in the Gray Herbarium of this species, described more than a century ago.

During our earlier seasons, when we had our base at Virginia Beach, Long and I had several times followed the overgrown and greatly obstructed Pungo Causeway, an old highway leading from below Land of Promise to the likewise forsaken Pungo Ferry. At that period we were able to get only to the drowned border of the reed-marshes of North Landing River, just where the tropical Saw Grass, *Cladium jamaicense*, appears and where the northern Cranberry, *Vaccinium macrocarpon*, forms a carpet under this coarse and unpleasant sedge. Now things have changed. Pungo Ferry, originally crossing the North Landing

River, part of the federal Albemarle and Chesapeake Canal, but long abandoned, has been revived, and Pungo Causeway is now a surfaced road. When we drove in past the masses of *Smilax Walteri* and *S. laurifolia* which festoon the roadside and were now in full fruit, we suddenly saw many acres of *Eriophorum virginicum.* This and Cranberry indicated northern sphagnous conditions, but, alas, progress is most difficult in this area, every step a struggle through a mesh of tough and fierce *Smilax laurifolia,* like an unending chain of caltrops, and every misstep landing one either in its embrace or amongst the sharp and crowded, hard teeth of Saw Grass. Long and Correll braved these impediments to get grasshoppers and mosses, but I was content to dig out from the sphagnous knolls over-ripe material of *Rhynchospora alba,* another northern (circumboreal) species here at a remote southern limit.

While in this corner of the state we called in, at twilight, to get fruit of the *Bidens* north of Wallaceton. Its achenes were ripe (in fact the plants were heavily frosted). It proves, as we had expected, to be the characteristic Cape Cod *B. coronata* var. *brachyodonta* Fernald. The mingling of northern and extreme southern plants in the swamps of this region was again emphasized. We also drove toward Baines Hill School for fruit of the new *Coreopsis.* This, fortunately, was now quite ripe and it quickly settled the relationship of the new plant. Slightly to the east of Suffolk, perhaps nearer Magnolia, we saw a strange inflorescence. It proved to be a tall virgate panicle of a *Chrysopsis,* such as we had never before found; and since the members of the *graminifolia*-series of that genus had perpetually given us puzzles, I have taken this new one as a starting-point for a study of the series in Virginia and the Carolinas. This, including two new species and two new varieties, with four plates (741–744) will be found in Part II.

Returning to Claremont for the strange variety of *Eupatorium rugosum,* we got a full series in lingering flower and in fruit; and the character of the involucre which we had noted in September (the oblong phyllaries green and herbaceous, instead of linear and scarious), accompanying the small and scabrous leaves, indicated a local variety (PLATE 739) of that wide-ranging species. Farther down the James, along Burwell's Bay, below

Rushmere, we had formerly collected a gigantic extreme of *Strophostyles helvola*, with the leaflets broadly ovate and obtuse, not inclined to be fiddle-shaped and short-acuminate as in typical *S. helvola*, and twice as large as in the latter. Its flowers were also larger. Now, in mid-October, the fruit was ripe, the long legumes bearing beans up to 12 mm. long. It proves to be var. *missouriensis*, not recorded from Virginia.

Wishing to try the Rappahannock again, we proceeded to Port Royal, but, the shore there being not very available in limited time, we contented ourselves with *Rhynchospora macrostachya* var. *colpophila* and then drove farther down-river in Caroline County, finally taking a farm-road from near Return to the river-margin. The old place on the river, now owned by Mr. and Mrs. Snowden, is very interesting. Mr. Snowden, a retired teacher, and his alert wife fully value the traditions of the old plantation and we were inclined, as they showed us portions of the buildings and many Indian relics dug up on the grounds, to forget that we had come to look at the shore. Here was *Ericocaulon Parkeri*, our first from this river; but we soon became absorbed in the masses of trees and shrubs on the bank and back of the beach. Everything cultivated on the old plantation had evidently run wild and multiplied on the steep bank. Many familiar cultivated shrubs and trees there abound, and the shrubby *Vinca major* L., with branches 6 feet long, made a wonderful dark-leaved thicket. It is unnecessary here to make a catalogue of old garden plants, but the most notable of the naturalizations was Kentucky Coffee Tree, *Gymnocladus dioica*, here at home and heavily (in both senses) fruiting. A few miles to the southeast, we turned in near Loretto in Essex County and came to another stretch of shore, there establishing Rappahannock stations for *Isoetes saccharata*, *Aneilema Keisak* Hassk. and some other tidal-marsh species. *Hypericum prolificum* abounded and, in the woods, *Poncirus trifoliata* (L.) Raf. was loaded with fruit. We had been amazed when, some years ago, we found this small Asiatic orange slightly naturalized near Claremont on the James. On the Rappahannock it is 60 miles farther north.

Planning to make a last trip of the season to productive stations in Greensville County, we decided that, instead of following the usual roads from below Petersburg into the city, there picking

up the route to Emporia, we would go south on U. S. Route 1 and pick up a cross-road to the Emporia route. The road from McKenney, 15 or 20 miles back in the Piedmont, straight across to Stony Creek at the inner border of the Coastal Plain, was one we had never taken; that seemed the proper choice and it would get us promptly to Stony Creek, thence to Emporia. We somehow never learn that, if we want promptly to reach a distant point, it is unwise to take an unfamiliar road! Promptly when we swung from Route 1 at McKenney into the Stony Creek road, I called a halt. At the border of the woods I saw too many Coastal Plain plants. A couple of hours in flat pineland, a characteristic Coastal Plain habitat, revealed that, back here in supposed Piedmont country, there is a tongue of typical Coastal Plain deposits and vegetation, an evident arm or inlet of the Miocene sea. *Helianthus angustifolius*, *Cirsium virginianum* and *Solidago perlonga* Fernald were conspicuous and dominant, all belonging chiefly to the rockless area to the east, and soon we were collecting *Gentiana cherokeensis* (W. P. Lemmon) Fernald, the species of northwestern Georgia which had its only known additional station in the flat pineland east of Stony Creek. Then Correll brought in characteristic material of *Hypericum denticulatum* Walt., a species we had known in eastern Virginia only from a single small station in Greensville County. It was late in the season, consequently most species were now unrecognizable but sharing the thicket with *Chionanthus*, as abundant as we have ever seen it, was a shrub quite new to the Coastal Plain list, the inland *Viburnum Rafinesquianum* Schultes. Furthermore, here was the same puzzling *Muhlenbergia* which in late August of 1938 had perplexed us in Assamoosick Swamp and, again, in October of that year had seemed both strange and familiar to us in the flat pinelands, with *Gentiana cherokeensis*, east of Stony Creek. Turning up now with the same associates in the flat pineland near McKenney, it has more than piqued our curiosity; and well it might, for it proves to be the very characteristic *M. brachyphylla* Bush, heretofore known in low woods and prairies from Texas to Nebraska, Iowa, Illinois and Indiana. Obviously the flat pineland just east of McKenney needs attention through the season.

Driving slowly now, for the immediate problem was the

important one, we noted many spots for future exploration and shortly before leaving Dinwiddie County we were attracted to a wet depression in the woods. It was a typical bit of Coastal Plain, mossy and wet and given over largely to the local *Rhynchospora cephalantha* Gray, *Xyris platylepis* and other characteristic and local species of the Coastal Plain; and bordering the swamp there were as handsome and profusely fruiting shrubs of the tropical *Cyrilla racemiflora* as we ever saw. We had been, and who would not be, very enthusiastic over the great beauty of fruiting *Cyrilla* at the eastern border of the Dismal Swamp but here, at a new northern and inland limit, it was quite as beautiful.

Obviously, having spent some hours in covering the 18 miles of fine road between McKenney and Stony Creek, we must postpone much of the Greensville County programme. We, consequently, went in to Emporia for one of the delicious and sumptuous dinners supplied by Mrs. Harrison and then drove north to the region of Orion. It was important to try again (after many failures) to find flowers on the puzzling *Aconitum* which leans over a woodland brook slightly below Double Bridge. At last there was a flower, a solitary one on a single plant. The two colonies here and the one at Carey Bridge are too much shaded for flowering, but the single specimen secured settles the identity. The plant will be described and illustrated (PLATE 720) in Part II. Along this brook there is a fine colony of *Lycopodium lucidulum*, and Correll, always with an eye for orchids, contributed a specimen of *Spiranthes ovalis*, already known at several stations but not in Greensville County.

Some years earlier we had picked up a few plants of the pink-rayed and very little known *Boltonia Ravenelii* Fernald & Griscom in bottomland-woods of Fontaine Creek, southwest of Haley's Bridge. The species is known only from Ravenel's original collections, made in 1846 at Santee Canal, South Carolina, and our meagre material. Starting again on this last errand, we safely passed Emporia and got nearly to Taylor's Millpond, where on a mossy savannah-like swale *Lycopodium carolinianum*, at its only known Virginia station, mingles with other paludal species. Wishing to show this *Lycopodium*-assemblage to Correll, we took time off. During our last two visits there the swale was drowned by heavy rains and we were

at disadvantage in collecting. Now it was comfortably dry and we could see the plants. Some colonies of *Lycopodium inundatum* var. *adpressum* Chapman were of the forma *polyclavatum* (McDonald) Fernald; and growing with it there was a similar form, with forked fruiting branches, of the coarser var. *Bigelovii*, the latter form not previously known. These were, however, relatively "small potatoes" as compared with the next discovery. *Muhlenbergia capillaris*, with delicate purple panicles, grows in small clumps in relatively dry soils of eastern Virginia, but here, occupying perhaps an acre of wet sphagnous swale or savannah, there was a solid stand of a *Muhlenbergia*, in dense tussocks, with bronzy-brown panicles just flowering in mid-October. The obvious course was to take a good series of it. It is fortunate that we did so, for, whereas *M. capillaris* has prolonged and slender glumes and long awns, the plant from near Taylor's Millpond has the glumes broad, short and bluntish and the awns very short. It is *M. expansa* (DC.) Trin., heretofore unknown north of southeastern North Carolina.

The stretch of bottomland on Fontaine Creek, where we vaguely remembered getting *Boltonia Ravenelii*, has grown up to a dense mass of giant herbs, and search for an hour or more failed to bring it to light. Another year, slightly earlier in the season, we may have better luck; but one plant of this area greatly interested us. We had already collected it, in September, at the margin of a bottomland of the Blackwater in Southampton, then immature. Now it was in splendid condition, a *Panicum dichotomiflorum* with tiny spikelets like those of the Cape Cod and New Jersey var. *puritanorum* Svenson, but the plants gigantic, with sprawling culms more than 6 feet long, primary panicles more than a foot long and principal leaves more than an inch broad. In the relatively dwarf northern var. *puritanorum* the narrow leaves are smooth, in this Virginia plant harshly scabrous. It will be described in Part II. In crossing the now dried-out bed of Fontaine Creek we found the logs and mossy islets carpeted with *Micranthemum umbrosum* (Walt.) Blake. We had previously known it along Three Creek, of the Nottoway System, and on the Blackwater in Isle of Wight County; now we record it from the Meherrin system.

Our last day in a very hurried trip had yielded one species

new to Virginia and a geographic variety and a minor form new to science. In fact, during our eight days in the field in October we had maintained a daily average of more than two plants new to the state, at least one a day new to science. Starting the seventh century with a score of 50 as a liberal margin, we had overtopped the 700 additions to the state flora by 51 extra; that in a region actively investigated at intervals through nine seasons. But we have not reached the end. Only the restrictions on use of gasoline blocked our programme in 1942, when, in an area not previously appreciated, we were getting in a single day four native plants new to Virginia, three of them apparently new to science. Repeating my statements in previous articles: There is plenty to do; there are few thoroughly prepared to do it.

Part II. Range-extensions, technical Notes and Revisions

In Part II, as in previous papers of the series, I have assembled in compact form for quick reference, the principal records of range-extensions found in the diffuse narrative. With them are some not there noted and a few based upon collections made by others. Several revisions of groups growing out of our Virginia observations are included. The plates have been prepared with utmost patience by my assistant, Dr. Bernice G. Schubert. The cost of the engraver's blocks has been partly met through an appropriation for personal research from the Department of Biology of Harvard University. For meeting a large part of the expense of their reproduction I am again indebted to the generosity of Mr. Long. In the citation of specimens (except in new descriptions or in formal revisions) the collectors, *Fernald & Long* (or their associates) are omitted. Plants thought to have been previously unrecorded from the state are indicated by an asterisk (*).

Dryopteris celsa (Wm. Palmer) Small. Many additional stations in Surry, Nansemond and Norfolk Counties; often so abundant as to invade soft-shoulders of roads in calcareous woods. See p. 354.

Osmunda Claytoniana L. Isle of Wight County: rich calcareous wooded slopes along James River, west of old Fort Boykin, no 12,912. Only a single plant noticed, our first from the Coastal Plain of the state. See p. 345.

*O. cinnamomea L., var. glandulosa Waters. King and

QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,209. Very abundant and the only form present. See p. 353.

LYCOPODIUM LUCIDULUM Michx. To the station already reported in Southampton County add one in GREENSVILLE COUNTY: rich woods along brook entering Nottoway River below Double Bridge, north of Orion, no. 13,506. See p. 374.

L. INUNDATUM L., var. ADPRESSUM Chapm., forma POLYCLAVATUM (McDonald) Fern. in RHODORA, xlii. 405 (1940). To the station in Sussex County add one in GREENSVILLE COUNTY: argillaceous and sphagnous meadow northwest of Taylor's Millpond, no. 13,853. See p. 375.

*L. INUNDATUM L., var. BIGELOVII Tuckerm., forma **furcatum,** f. nov., ramibus fertilibus plus minusve furcatis strobilis 1–4. GREENSVILLE COUNTY, VIRGINIA: argillaceous and sphagnous meadow northwest of Taylor's Millpond, October 14, 1941, *Fernald & Long*, no. 13,852 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). With and closely simulating the preceding, but with the thick strobiles and loosely spreading-ascending sporophylls of var. *Bigelovii.* See p. 375.

ISOETES ENGELMANNI A. Br., var. CAROLINIANA A. A. Eaton. Range extended northward to JAMES CITY COUNTY: bottomland woods along Powhatan Creek, northwest of Five Forks, no. 13,210.

I. SACCHARATA Engelm. Local range extended to tidal shores of the Chickahominy and Rappahannock Rivers. CHARLES CITY COUNTY: Chickahominy River, Graves Landing, north of Holdcroft, no. 13,507. NEW KENT COUNTY: Chickahominy River, Lanexa, no. 13,508. ESSEX COUNTY: Rappahannock River, northeast of Loretto, no. 13,855. See p. 372.

TYPHA TRUXILLENSIS HBK. To the stations on the shores of Back Bay add another in PRINCESS ANNE COUNTY: reed-marsh along Blackwater River, southwest of Pungo Ferry, no. 13,856. See p. 370.

POTAMOGETON SPIRILLUS Tuckerm. Range extended slightly southward, into CHARLES CITY COUNTY: fresh tidal margin of Chickahominy River, near Cypress Bank Landing, nos. 13,217 and 13,218. See p. 356.

ZANNICHELLIA PALUSTRIS L., var. MAJOR (Boenn.) Koch. ISLE OF WIGHT COUNTY: spring-pool in cypress swamp back of sand-beach of James River, below old Fort Boykin, no. 13,513; an extraordinary habitat, the plant (usually of brackish waters) here filling a spring-pool constantly replenished with fresh water by an active hydraulic ram! See p. 361.

SAGITTARIA WEATHERBIANA Fern. Range extended north to SURRY COUNTY: forming extensive colonies at margin of sluggish stream, Cypress Swamp, near Sexton, no. 12,920.

*S. EATONI J. G. Sm. Sterile plants with fleshy phyllodia and no petioled blades or flowering scapes are characteristic in fresh tidal mud. They seem to be the poorly understood *S. Eatoni*, not recorded from south of the lower Delaware. ESSEX COUNTY: shore of Rappahannock River, northeast of Loretto, no. 13,858. NEW KENT COUNTY: Lacey Creek, west of Walker, no. 13,514. CHARLES CITY COUNTY: Chickahominy River, near Cypress Bank Landing, no. 13,221; Chickahominy River, Graves Landing, north of Holdcroft, no. 13,515; Chickahominy River, Matahunk Neck, no. 13,857. See pp. 356 and 368.

*S. ENGELMANNIANA J. G. Smith, forma DILATATA Fern. NORFOLK COUNTY: sphagnous and peaty thickets near Jericho Ditch, Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,516. Although Smith, in his Revision of the North American Species of Sagittaria and Lophotocarpus, 15 (1894), cited no positive stations from south of Delaware, he noted with a doubt a Chapman plant thought to come from Florida. It is, therefore, noteworthy that in July, 1895, the late *C. S. Williamson* collected the typical narrow-leaved *S. Engelmanniana* at Wilmington, North Carolina (Herb. Phil. Acad.) and in 1939 *Godfrey & Tryon* collected several numbers of it at Colclough Pond, northwest of Manning, in Clarendon County, South Carolina. See p. 365.

[ECHINODORUS TENELLUS (Martius) Buchenau was reported in Mrs. Erlanson's *Flora of the Peninsula of Virginia*, Papers Mich. Acad. Sci. Arts and Lett. iv. 120 (1924), as occurring along the Chickahominy at Lanexa, *Grimes*, no. 4135. The specimen in the Gray Herbarium of no. 4135 is of *Sagittaria subulata* (L.) Buchenau, a common species on tidal shores of the Chickahominy. No. 4135 in Grimes's own series (at the New York Botanical Garden), labeled *Echinodorus tenellus*, is a very rare new species of *Bacopa* (of the *Scrophulariaceae*), which, it is safe to assert, was not found at Lanexa! The bases of the report of *E. tenellus* are completely confused.]

LIMNOBIUM SPONGIA (Bosc) Steud. To the few stations in Princess Anne County add the following in NORFOLK COUNTY: springy spots and rills, sandy and peaty margin of Lake Drummond, near Jericho Ditch, Great Dismal Swamp, west of Wallaceton, no. 13,519; very abundant in lowest areas of river-swamp along Northwest River, northeast of Northwest, no. 13,861. See pp. 365 and 370.

The correct citation of the name is *Limnobium Spongia* (Bosc) Steudel, Nom. ed. 2, ii. 45 (1841); not (Bosc) L. C. Richard, as given in Britton & Brown, Ill. Fl. i. 94 (1896) and accepted by others. The original very detailed description, with beautiful plate, was under *Hydrocharis Spongia* Bosc, Ann. Mus. d'Hist. Nat. Paris, ix. 396, t. 30 (1807). In Mém. Inst. Paris, xxxii. 32,

t. 8 (1812) Richard described as new and gave a very detailed plate of *L. Bosci* (not *L. Spongia* as recently cited) and on page 66 (the page cited by Britton & Brown for *L. Spongia*) he defined the genus *Limnobium*, without using any specific name; but on page 78, in an enumeration of genera and species of the family, he cited Bosc's original name in the synonymy of *L. Bosci*. The original specific name, *Spongia*, was first transferred into *Limnobium* by Steudel.

*Bromus racemosus L. Isle of Wight County: waste ground back of sand-beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,923. Not mapped by Hitchcock from Virginia. See p. 344.

*B. arvensis L. Isle of Wight County: border of cultivated field back of James River, west of old Fort Boykin, no. 12,921. Cited by Hitchcock only from eastern Maryland. See p. 344.

B. purgans L. Isle of Wight County: specimens from seeping argillaceous and calcareous bluffs along Burwell's Bay, below Rushmere, no. 12,926, establish a record of 2 m. in height, with leaves 2 cm. broad.

Festuca rubra L. Extending up the James to northern Nansemond County: upper border of sandy beach of James River, Eclipse, no. 12,928.

Diplachne maritima Bicknell. Extending inland to Essex County: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,226. See p. 354.

Elymus virginicus L. Isle of Wight County: specimens from seeping calcareous wooded bluffs by James River, west of Fort Boykin, no. 12,932, are 1.4 m. high. See p. 345.

*E. virginicus L., var. jejunus (Ramaley) Bush. Eastern range extended south from New Jersey to Charles City County: cypress swamp by Chickahominy River, Cypress Bank Landing, no. 13,229. Isle of Wight County: base of rich calcareous wooded slopes by Burwell's Bay, James River, below Rushmere, no. 13,227. See p. 357.

E. riparius Wiegand. To the few recorded stations add one in Sussex County: alluvial woods along Nottoway River, Green Church Bridge, northwest of Owen's Store, no. 13,864.

Aira praecox L. To the few recorded stations add one in Nansemond County: sandy clearing near Western Branch, south of Reid's Ferry, no. 13,230.

Leptochloa filiformis (Lam.) Beauv. Local range extended to Prince George County: weed in cultivated field by James River, Jordan Point, no. 13,530. In Rhodora, xlii. 390 (1940) this species, as a weed in Petersburg, was recorded by clerical error as *L. fascicularis*, which we do not know in Virginia.

Agrostis stolonifera L., var. compacta Hartm. To the few recorded stations add one in Nansemond County: border of brackish marsh along Western Branch, south of Reid's Ferry, no. 13,231.

*Phleum pratense L., var. nodosum (L.) Richter. Isle of Wight County: turfy waste ground back of sand-beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,935.—Differing from typical *P. pratense* in its more slender inflorescence, with shorter and smoother spikelets, with less bristly-ciliate keels. Our first American collection. See p. 344.

*Muhlenbergia expansa (DC.) Trin. (*M. trichopodes* Chapm.). Greensville County: argillaceous and sphagnous meadow northwest of Taylor's Millpond, no. 13,866, growing in large stools over an extensive area. The first from north of Wilmington and adjacent area in southeastern North Carolina. See p. 375.

*M. brachyphylla Bush. Sussex County: border of Assamoosick Swamp, about 2 miles northeast of Homeville, no. 8956; moist argillaceous pineland about 2 miles east of Stony Creek, no. 9532. Dinwiddie County: open argillaceous low woods just east of McKenney, no. 13,865.—First from east of Indiana, Missouri and eastern Texas, Deam speaking of it as growing in Indiana "in low, flat woods", Palmer & Steyermark assigning it in southern Missouri the habitat, "Prairie banks and low moist woods". In habit the plant suggests very slender but unusually branched *M. foliosa*, with rhizomes, panicles, glumes and long-awned lemmas of *M. tenuiflora* of more upland and richer habitats, the slender lateral branches numerous and terminated by exserted panicles, the internodes glabrous throughout or barely scabrous at summit, the callus and base of lemma bearded. See p. 373.

Paspalum fluitans (Ell.) Kunth. To the few recorded stations add one in Southampton County: open muddy and sandy borders of pools, alluvial bottomlands of Three Creek, Druryville, no. 13,538. See p. 367.

Panicum caerulescens Hack. Local range extended inland to Dinwiddie County: open argillaceous low woods just east of McKenney, no. 13,871. Norfolk County: fresh reed-marsh and swale along Northwest River near Northwest, no. 13,872.

P. mutabile Scribn. & Sm. Local range extended to northern Nansemond County: dry sandy woods along Nansemond River, east of Cahoon Pond, northwest of Suffolk, no. 13,246.

P. Ravenelii Scribn. & Merr. Range extended northward to King William County: sandy oak woods southwest of Aylett, no. 13,245.

*Panicum dichotomiflorum Michx., var. **imperiorum,** var.

nov., culmis crassis 0.8–2 m. altis deinde depressis furcatisque; vaginis glabris, laminis primariis 0.7–2.5 cm. latis paginis superioribus scaberrimis; paniculis primariis breviter exsertis 2–4 dm. longis, paniculis lateralibus deinde numerosis late ovoideis ramis horizontaliter divergentibus; spiculis oblongo-lanceolatis vel anguste ellipsoideis breviter acutiusculis 1.8–2.3 mm. longis, gluma superiore lemmateque sterili submembranaceis fructus paullo superantibus.—VIRGINIA: damp clearing in woods along Blackwater River, east of Oak Grove School, Southampton County, September 11, 1941, *Fernald & Long*, no. 13,540 (primary panicle partly expanded); wooded bottomland, Fontaine Creek, southwest of Haley's Bridge, Greensville County, October 14, 1941, *Fernald & Long*, no. 13,877 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.), primary panicle over-ripe, lateral panicles mature. See p. 375.

Panicum dichotomiflorum, var. *imperiorum* (of the Dominions) is the southern representative of var. *puritanorum* Svenson in RHODORA, xxii. 154 (1920). In its short, thick and short-tipped spikelets with submembranaceous 2nd. glume and sterile lemma it is inseparable from the northern var. *puritanorum* and might be taken for a gigantic development of that small plant (culms slender, 0.3–6 dm. high or long; leaf-blades 1–8 mm. broad; primary panicle 0.2–2.5 dm. long); but var. *puritanorum* has the leaf-surfaces quite smooth (margins sometimes scabridulous), while the surfaces of the blades of var. *imperiorum* are harsh above and often below. In typical *P. dichotomiflorum* and var. *geniculatum* (Wood) Fernald in RHODORA, xxxviii. 387, pl. 441, fig. 2 (1936) and var. *bartowense* (Scribn. & Merr.) Fernald, l. c. the more slender and acuminate spikelets are 2.6–3.6 mm. long, the 2nd. glume and sterile lemma subcoriaceous.

P. HEMITOMON Schultes. To the few recorded Virginia stations add one in NORFOLK COUNTY: extensive colonies at border of wooded swamp along Northwest River, southeast of Cornland, nos. 13,875 and 14,280. See p. 369.

SACCIOLEPIS STRIATA (L.) Nash, forma **gibba** (Ell.), comb. nov. *Panicum gibbum* Ell., Sketch Bot. S. C. and Ga. i. 116 (1816). *P. Elliottianum* Schultes, Mant. ii. 256 (1824). *S. gibba* (Ell.) Nash in Britton, Man. 89 (1901). See p. 355.

Typical *Sacciolepis striata* is glabrous throughout. The type of the species is Clayton's no. 590 in the Linnean Herbarium, described by Linnaeus as *Holcus striatus* L. Sp. Pl. ii. 1048 (1753), with an unusually full diagnosis, with "*vaginis crassiusculis*

striatis", but no mention of pubescence. The Grovonian description of no. 590, cited by Linnaeus, similarly makes no mention of pubescence; and a photograph of this type, in the Gray Herbarium, shows perfectly glabrous sheaths. This plant, with glabrous sheaths is wide-ranging, from Texas to Florida and the West Indies, northward to Oklahoma, Tennessee and on the Coastal Plain to southern New Jersey. All our collections from the James River northward belong to it.

South of the James in Virginia the plant sometimes has the lower, middle and sometimes the upper sheaths hirsute, this hirsute-sheathed form occurring occasionally to Florida and Texas; but that it is less common south of Virginia than the glabrous-sheathed plant is evident even from the meagre representation of the species in the Gray Herbarium: from North Carolina typical *S. striata* (glabrous sheaths) 3, forma *gibba* (hirsute sheaths) 1; Florida, typical *S. striata* 17, forma *gibba* 1. Forma *gibba* is *Panicum gibbum* Ell. or *Sacciolepis gibba* (Ell.) Nash; Elliott's detailed description noting the "leaves . . . somewhat scabrous, pubescent, expanding; sheaths . . . , the lower ones hispid".

The Virginia material in the Gray Herbarium is as follows. Sacciolepis striata (L.) Nash (typical). Stafford County: Brooke, *F. J. Hermann*, no. 10,408. New Kent County: Windsor Shades, no. 11,244. Warwick County: east of Harpersville, no. 8579. Princess Anne County: near Creed's, no. 4775.

*Forma gibba (Ell.) Fern. Princess Anne County: Virginia Beach, *Heller*, no. 1263, *Fernald, Griscom & Long*, no. 4546; Rifle Range, south of Rudy Inlet, no. 4264; Cedar Island, no. 12,260. Norfolk County: Lake Drummond, Great Dismal Swamp, no. 13,238; border of wooded swamp along Northwest River, southeast of Cornland, no. 13,879. Dinwiddie County: Burgess, no. 7294.

Echinochloa Walteri (Pursh) Heller, forma laevigata Wieg. Range extended inland to Norfolk County: wet woods and thickets near the Feeder Ditch from Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,545; deep peat and mud, southeastern shore of Lake Drummond, no. 13,546.

Setaria magna Griseb. Add other stations in Norfolk County: border of roadside ditch in wooded swamp along Northwest River, southeast of Cornland, no. 13,882; disturbed soil, wet woods and thickets near the Feeder Ditch from Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,549.

ERIANTHUS BREVIBARBIS Michx. To the single recorded station add another in SUSSEX COUNTY: alluvial woods along Nottoway River, Green Church Bridge, northwest of Owen's Store, no. 13,884. See p. 367.

*ANDROPOGON PRAEMATURUS Fernald, forma **hirtivaginatus,** f. nov., vaginis basilaribus hirtis vel pilosis. TYPE: open pineland near Mason's Siding, about 1 mile north of Henry, Sussex County, Virginia, August 3, 1941, *Fernald & Long*, no. 13,248.

Andropogon praematurus Fernald in RHODORA, xlii. 413, t. 626, figs. 1–3 (1940), like so many species of the genus, has the sheaths either quite glabrous or obviously pubescent. The TYPE, *Fernald & Long*, no. 10,092, is strictly glabrous. The originally cited material of *A. praematurus* consisted of both the glabrous and the pubescent-sheathed forms, which often, as in other species, grow side by side.

CYPERUS OVULARIS (Michx.) Torr., var. SPHAERICUS Boeckl. To the single recorded station add three others. JAMES CITY COUNTY: sandy roadside bank about 2 miles northwest of Toano, no. 13,258; clearing in woods south of Ewell, no. 13,259. GREENSVILLE COUNTY: exsiccated argillaceous fallow field near Meherrin River, northeast of Gaskins, no. 13,261.

FIMBRISTYLIS CASTANEA (Michx.) Vahl. Range extended inland to ESSEX COUNTY: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,270. See p. 354.

F. CAROLINIANA (Lam.) Fern. With the last, no. 13,271. See p. 354.

ELEOCHARIS PARVULA (R. & S.) Link. Extensive inland station in northern NANSEMOND COUNTY: carpeting a shallow pool, border of salt marsh by James River, Eclipse, no. 12,945.

E. ALBIDA Torr. Extending inland to ESSEX COUNTY: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,266. See p. 354.

E. TORTILIS (Link) Schultes. Inland to KING AND QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,268. See p. 353.

SCIRPUS POLYPHYLLUS Vahl. KING WILLIAM COUNTY: border of magnolia swamp about 2 miles northeast of St. Stephen's Church, no. 13,272. Our first collection on the Coastal Plain of the state. See p. 353.

*S. ERIOPHORUM Michx., forma **praelongus,** f. nov., spiculis deinde 8–12 mm. longis.—VIRGINIA: damp peaty depressions in sandy pineland, Cape Henry, September 7, 1935, *Fernald & Long*, no. 4821; fresh reed-marsh and swale along Northwest

River near Northwest, October 11, 1941, *Fernald & Long*, no. 13,894 (TYPE in Herb. Gray.).

The counterpart in *Scirpus Eriophorum* of similar forms with the rachillas of the spikelets much prolonged, such as are occasionally found in other species of the genus and in *Cyperus* and other genera. In both collections of forma *praelongus* the inflorescence is very small for the species, only 1–1.5 dm. high and about 1 dm. broad. Well developed typical *S. Eriophorum* (with spikelets 3–7 mm. long) has the inflorescence 2–3.5 dm. high and 1.5–2.5 dm. broad. In forma *praelongus* the vigor of the plant seems to concentrate on the spikelets!

ERIOPHORUM VIRGINICUM L. To the few recorded stations on the Coastal Plain of the state add one in NORFOLK COUNTY: sphagnous and peaty thickets near Jericho Ditch, Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,560. See p. 364.

RHYNCHOSPORA MACROSTACHYA Torr. Thus far typical *R. macrostachya* is known in the state only from shores of Lake Drummond. To old collections by others, add our nos. 13,563 and 13,564, both from NORFOLK COUNTY. See p. 364.

R. MACROSTACHYA Torr., var. COLPOPHILA Fernald & Gale. To the localities already listed add the following, all on fresh tidal shores and marshes. CAROLINE COUNTY: Rappahannock River, Port Royal, no. 13,897. ESSEX COUNTY: Rappahannock River, northeast of Loretto, no. 13,898. CHARLES CITY COUNTY: Chickahominy River, Cypress Bank Landing, no. 13,565. NORFOLK COUNTY: Northwest River near Northwest, no. 13,896. See pp. 369 and 372.

R. ALBA (L.) Vahl. PRINCESS ANNE COUNTY: savannah-like opening in wooded swamp of North Landing River, west of Pungo Ferry, no. 13,899. Our first evidence of this circumboreal species on the Coastal Plain of the state. See p. 371.

R. HARVEYI Wm. Boott. To the few recorded stations add one in SUSSEX COUNTY: very local, open pineland near Mason's Siding, about 1 mile north of Henry, no. 13,274.

R. CEPHALANTHA Gray. To the very few stations add one in DINWIDDIE COUNTY: depression in argillaceous woods west of Winfield's Mill, nos. 13,901 and 13,902. See p. 374.

R. MICROCEPHALA Britton. Local range extended to KING AND QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,275.

R. CHALAROCEPHALA Fernald & Gale. NORFOLK COUNTY: finely developed and abundant on shores of Lake Drummond, nos. 13,276, 13,277 and 13,540. See pp. 359 and 365.

R. CADUCA Ell. To the several localized stations add the fol-

lowing in Norfolk County: wooded river-swamp and margin of Northwest River, northeast of Northwest, nos. 13,904 and 13,905. See p. 370.

*R. miliacea (Lam.) Gray. Norfolk County: old specimen in Herb. Phil. Acad., coll. *Reed.*

*Cladium mariscoides (Muhl.) Torr. Princess Anne County: border of swampy or inundated woods, north of Blackwater River, no. 3802; savannah-like opening in wooded swamp of North Landing River, west of Pungo Ferry, no. 13,907. Norfolk County: fresh reed-marsh and swale along Northwest River, near Northwest, no. 13,906. See p. 369.

*Carex Ruthii Mackenz. Smyth County: at 2500 feet along Nick's Creek, near base of Pine Glade Mountain, June 4, 1892, *J. K. Small*, distrib. as *C. echinata* Murr.—*C. Ruthii*, described from Big Craggy Mountain, Buncombe County, North Carolina, and recorded by Mackenzie as otherwise known only from the mountains of eastern Tennessee and of Georgia, indicates the rich harvest of northern extensions to be made when the westernmost counties of Virginia are thoroughly scrutinized; as does, also, *Eupatorium roanense*, described by Small only from Roan Mountain at the border of Tennessee and North Carolina. See discussion under *Eupatorium*.

C. normalis Mackenz. To the very few recorded Coastal Plain stations add one in Surry County: alluvial woods along Gray's Creek, west of Old Courthouse Corners, no. 9845.

C. festucacea Schkuhr, *sensu* Mackenz. Whereas *C. straminea* Willd., *sensu* Mackenz., is very common in southeastern Virginia, *C. festucacea* is local. The following nos. are before me. Elizabeth City County: borders of old fields in dry soil near Buckroe, *B. L. Robinson*, no. 338; marshy border of woods between Buckroe and Hampton, *Robinson*, no. 338^{a}; both distrib. as *C. straminea.* Sussex County: alluvial bottomland woods along Nottoway River, west of Homeville, no. 11,754; swales and wet thickets south of Stony Creek, no. 11,755.

C. hormathodes Fern. To Grimes's stations in James City County add one in Isle of Wight County: swale by Burwell's Bay, James River, at Bailey's Beach, near Rushmere, no. 12,690. See p. 344.

*C. physorhyncha Liebm. Dinwiddie County: dry meadow, clearing along Appomattox River, just above the "fall-line", about 2 miles west of Petersburg, no. 11,770; extension north from South Carolina.

*C. nigromarginata Schweinitz, var. floridana (Schweinitz) Kükenthal (*C. floridana*). Elizabeth City County: in the graveyard, Fortress Monroe, April 8, 1887, *G. G. Kennedy* in Gray Herb.

Var. *floridana* differs from *Carex nigromarginata* in its loosely stoloniferous habit, with horizontally elongate, slender stolons, less fibrillose bases of the old leaves, uniformly pale scales (*C. nigromarginata* may have the scales pale), and less sharply trigonous achenes. In the North American Flora, xviii[4]. 192 (1935) Mackenzie gives it the range, "Georgia and Florida to Texas," adding the "Note: *Carex nigromarginata* Schw. occasionally has light-colored scales when growing in dense shade. It is probably such a specimen which is the basis of the record of *Carex floridana* from Virginia given by Kükenthal in Engler (Pflanzenreich **4**[20]: 445), from which is taken the statement in Britton & Brown (Ill. Fl. ed. 2. **1**: 393)." Dr. Kennedy's material from Fortress Monroe, although young, has the horizontal and slender stolons nearly 2 dm. long, the scarcely fibrillose sheaths and the pale spikes which in combination place it in var. *floridana.* Similarly, *Weatherby & Griscom's* no. 16,460 from Horry County, South Carolina, was correctly reported by them as var. *floridana* (when they proposed the reduction of *C. floridana* to the varietal status already given it by Kükenthal in 1909) in Rhodora, xxxvi. 39 (1934).

*C. debilis Michx., var. intercursa Fernald in Rhodora, xliv. (1942). Henrico County: Richmond, May 9, 1894, *J. R. Churchill.* Greensville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, no. 12,016. See p. 348.

*C. abscondita Mackenz., var. **rostellata** var. nov., foliis firmis glaucescentibus; perigyniis 3–4.5 mm. longis rostellatis; squamis foemineis 2–3 mm. longis.—Virginia: swampy depressions in pine barrens, south of Lee's Mill, Isle of Wight County, June 8, 1940, *Fernald & Long,* no. 12,012 (type in Herb. Gray.; isotype in Herb. Phil. Acad.); woods near Hampton, May 16, 1905, *C. F. Wheeler.* Alabama: wet woods about half a mile south of Ocklocknee, Leon County, April 12, 1925, *R. M. Harper,* no. 13.

Var. *rostellata* has the large and definitely beaked perigynium and the relatively firm leaves of the extreme southern (Floridan) *Carex abscondita,* var. *glauca* (Chapm.) Fernald in Rhodora, xxxvii. 406 (1935), i. e. *C. magnifolia* Mackenzie. That variety, however, has the pistillate scales very short, only 1–barely 2 mm. long and about one fourth the length of the perigynia, whereas in var. *rostellata* they are about half the length of the

perigynia. In eastern Virginia, typical *C. abscondita*, a plant with subflaccid leaves, essentially beakless perigynia 2.5–3.5 mm. long and scales rarely more than one third their length, is a plant of the richest woodlands. Var. *rostellata*, on the other hand, occurs in acid and swampy pine barren.

*× C. **absconditiformis.** hybr. nov. (*C. abscondita* Mackenz. × *C. laxiculmis* Schwein.), planta inter *C. absconditam* et C. *laxiculmem* intermedia; foliis pallide viridibus subglaucescentibus ad 4.5 dm. longis 7–10 mm. latis; culmis vel 0.5–1.5 cm. altis bracteis valde prolongatis spiculisque ut in *C. abscondita* vel culmis elongatis 3–4.5 dm. altis spicis remotis longe pedunculatis, stamineis longe pedunculatis, bracteis brevibus.—VIRGINIA: bottomland woods along Nottoway River, east of Huske, Sussex County, June 13, 1941, *Fernald & Long*, no. 12,969 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); rich woods south of Hotwater, James City County, July 22, 1938, *Fernald & Long*, no. 8622. See p. 348.

× *Carex absconditiformis* greatly puzzled us in the field, where a considerable carpet of it combines in a most perplexing fashion the characters of *C. abscondita* and *C. laxiculmis*. Typical *C. abscondita* has the culms 0.5–2 dm. high, mostly somewhat hidden among the bases of the prolonged leaves (up to 3 dm. long and 4–9 mm. broad); the bracts greatly prolonged above the inflorescence, the upper subspathiform and much overtopping the crowded upper spikes, this fascicle of spikes with the short staminate one shorter than and somewhat hidden among the pistillate ones; and the pistillate scales are blunt. *C. laxiculmis* has elongate culms, up to 6 dm. high, these mostly overtopping the very glaucous leaves (up to 4.5 dm. long and to 12 mm. broad), the spikes scattered on long arching peduncles in the axils of relatively short and narrow non-spathiform bracts, the long staminate spike raised on a long peduncle; and the pistillate scales are awned or pointed.

× *Carex absconditiformis* is as exact a combination of the two as can be imagined: leaves as long and broad as in *C. laxiculmis* but not so glaucous; some short culms of *C. abscondita*, with the prolonged and spathiform bracts, crowded upper pistillate spikes and hidden staminate one, with pistillate scales either blunt or cuspidate; other culms from the same crown prolonged and with short bracts, scattered and long-peduncled pistillate spikes, with

the long staminate spike peduncled and the pistillate scales often blunt, as in *C. abscondita.*

* × C. copulata (Bailey) Mackenzie (*C. digitalis* Willd. × *C. laxiculmis* Schwein.) Surry County: dry woods near Blackwater River, about 1 mile southwest of Dendron, no. 12,964. Sussex County: bottomland woods along Nottoway River, east of Huske, no. 12,970. See p. 348.

× *Carex copulata* is, it seems to me, a semi-fertile hybrid of *C. digitalis* and *C. laxiculmis.* The trivial name was given by Bailey because the plant seemed to him to unite those two species. His original account was as follows:

> 57.—Carex digitalis, Willd., var. copulata.
> *C. retrocurva*, var. *copulata*, Bailey, Herb. Distr. 1886.
> Larger than the species, the culms weak and reclining, sometimes two feet long; leaves twice or thrice broader; spikes shorter and heavier; perigynium mostly larger.—Woods, central Michigan, where it is common. In aspect much like *C. laxiculmis*, but has no glaucousness, the upper spikes are shorter peduncled, and minor characters also separate them. I find it to be connected with *C. digitalis* by intermediate forms.—Bailey in Mem. Torr. Bot. Cl. i. 47 (1889).

It could have been said with more precision that it is "connected with" *C. laxiculmis.* Its broad and prolonged leaves, weak culms, "sometimes two feet long", its shorter and heavier spikes and larger perigynia are characters of the latter. Lack of bloom and the "minor characters" unstated placed it with *C. digitalis.* Additional material showing it to be as near *C. laxiculmis* Schwein. (*C. retrocurva* Dewey), I transferred it as *C. laxiculmis* var. *copulata* in Rhodora, viii. 183 (1906); but Mackenzie treats it as a species, *C. copulata* (Bailey) Mackenzie in N. Am. Fl. xviii^5. 251 (1935). Mackenzie cites it from New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Iowa and Missouri; and he says with characteristic assurance: "It is widely distributed and is certainly not a hybrid." Having once camped for nearly a month with Mackenzie and witnessed the promptmess with which he decided, when no other member of the party could find and none of the material collected shows well-filled achenes, that × *C. mainensis* Porter is a fertile species, I learned to look into matters before accepting his verdicts so positively asserted. So with × *C. copulata. C. digitalis* and *C. laxiculmis* are certainly good species. × *C. copulata* so combines their characters that Bailey threw it both ways and stated that it had

characters of both. In the Gray Herbarium the material gives the following score.

CONNECTICUT: Waterford, June 13, 1896, *C. B. Graves*, no good perigynia.

NEW JERSEY: Lower Valley, Hunterdon County, June 30, 1938, *Benner*, no. 8201, no developed perigynia at this late date; Pensauken, Camden County, June 15, 1918, *Long*, no. 19,091, no developed perigynia; Blackwood, Gloucester County, June 1, 1918, *Long*, no. 18,824 no developed perigynia.

PENNSYLVANIA: Lycoming County, May 27, 1939, *Wahl*, no. 291, perigynia soft, not well filled; Leolyn, Tioga County, June 5, 1937, *Clausen & Wahl*, no. 2512, some perigynia distended, most of them not.

VIRGINIA: Dendron, June 14, 1941, *Fernald & Long*, no. 12,964, no perigynia distended; east of Huske, June 13, 1941, *Fernald & Long*, no. 12,790, most perigynia soft and not distended.

MICHIGAN: Lansing, June 1, 1886, *Bailey*, N. Am. Carices, no. 161 (ISOTYPE), some perigynia distended, some not; Alma, June 15, 1895, *Charles A. Davis*, distended perigynia.

OHIO: Florence, July 24, 1897, *Moseley*, perigynia not distended.

INDIANA: Huntertown, Allen County, May 17, 1915, *Deam*, no. 15,692, perigynia not distended.

ILLINOIS: Joliet, June 15, 1904, *Wheeler & Skeels*, no. 268, perigynia mostly not distended.

Material of characteristic *Carex digitalis* and of *C. laxiculmis* shows no such proportion of unfilled perigynia.

C. COLLINSII Nutt. To the very few recorded stations add one in KING AND QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,285. See p. 353.

ERIOCAULON DECANGULARE L. To the very few recorded stations note one in NORFOLK COUNTY: sphagnous pocket at border of reed-marsh of Northwest River near Northwest, no. 13,908; already recorded by Kearney from Northwest. See p. 370.

E. PARKERI Robins. Local range extended to fresh tidal shores in four counties. CHARLES CITY COUNTY: Chickahominy River, near Cypress Bank Landing, no. 13,287. NEW KENT COUNTY: Lacey Creek, west of Walker, no. 13,576. CAROLINE COUNTY: Rappahannock River, northwest of Return, no. 13,909. ESSEX COUNTY: Rappahannock River, northeast of Loretto, n. 13,910. See p. 372.

XYRIS CAROLINIANA Walt., forma FLACCIDA Fern. Local range extended to NEW KENT COUNTY; fresh tidal shore of Lacey Creek, west of Walker, no. 13,577.

*X. FIMBRIATA Ell. NORFOLK COUNTY: east shore of Lake Drummond, Great Dismal Swamp, July 22, 1918, *J. Arthur Harris*, no. C18,119; edge of Lake Drummond, October 2, 1921, *Grimes*, no. 4527; wet sand and peat, near entrance to Ports-

mouth Ditch, Lake Drummond, very scarce, no. 13,585. Apparently rare as compared with *X. caroliniana* Walt. and *X. difformis* Chapm., which abound around Lake Drummond. See p. 364.

Aneilema Keisak Hassk. Range extended north to Essex County: sandy and muddy tidal shore of Rappahannock River, northeast of Loretto, no. 13,912. Also along south side of James River in Prince George County (Flowerdew Hundred, no. 12,982) and in Surry County (Claremont, no. 13,586). See p. 372.

Juncus subcaudatus (Engelm.) Coville & Blake. Local range extended into King and Queen County: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,298, gigantic plants with sprangling inflorescences 2.5 dm. long. See p. 353.

J. caesariensis Coville. To the scattered stations recorded add one in James City County: sphagnous border of shallow peaty pond-hole ½ mile east of Centerville, no. 13,297.

Uvularia pudica (Walt.) Fern., var. nitida (Britton) Fern. Local range extended into Dinwiddie County: scarce in dry woods west of Winfield's Mill, no. 13,916.

Hemerocallis fulva L., var. Kwanso Regel. Surry County: very abundant on sand-beach of Cobham Bay, James River, northwest of Chippokes, no. 13,300; obviously spread from near a deserted and collapsed dwelling and rapidly propagating.

Lachnanthes tinctoria (Walt.) Ell. Norfolk County: edge of Lake Drummond, Great Dismal Swamp, October 2, 1921, *Grimes*, no. 4536; wet sandy and peaty shore near entrance to "the Feeder", Lake Drummond, no. 13,304; similar habitat near entrance to Portsmouth Ditch, Lake Drummond, no. 13,305. Nansemond County: muddy and peaty southwestern shore of Lake Drummond, no. 13,590. See pp. 354 and 365.

So far as we yet know Lake Drummond is the only locality in Virginia where *Lachnanthes* is unquestionably indigenous, its colony on a cranberry-meadow in Augusta County (Carr, Rhodora, xlii. 92) being, according to Professor Massey, a probable introduction with cranberry-plants. So far as shown in the Gray Herbarium *Lachnanthes* is not found in North Carolina north of the lower Neuse, nor between Lake Drummond and Delaware. It was not recorded by Kearney from Lake Drummond.

*Leucojum aestivum L. Isle of Wight County: about ½ acre of densely crowded plants at border of woods (old house-site) near James River, west of old Fort Boykin, no. 12,992. Hanover County: very abundant over many acres of bottom-

land woods along Pamunkey River, north of Old Church, no. 14,131. See p. 344.

Hypoxis leptocarpa Engelm. & Gray. Range extended into two additional counties. Surry County: bottomland woods along Blackwater River, about 1 mile southwest of Dendron, no. 12,991. Isle of Wight County: sandy, recently cleared woods along Blackwater River, below Broadwater Bridge, north of Zuni, no. 13,306.

Spiranthes ovalis Lindl. To the scattered stations add one in Greensville County: rich woods along brook entering Nottoway River below Double Bridge, north of Orion, very rare, no. 13,921. See p. 374.

S. cernua (L.) Richard, var. odorata (Nutt.) Correll. Range extended north to New Kent County: fresh tidal shore of Chickahominy River, Lanexa, no. 13,922.

Basal Sprouts of Quercus alba.—In dry woods near the Nottoway River, near Peter's Bridge in Sussex and Southampton Counties, there occur dense circles of low oaks with prolonged subterranean rooting stems. These low shrubs, often only 2.5–5 dm. high are all sterile and they do not have the foliage of any of the low and stoloniferous species of the extreme South. Returning in June, 1941, to study them further and, if possible, to secure young fruit, we were so fortunate as to find, southwest of Lambs, a very complete circle of such young leafy shoots directly under the outer tips of the branches of a large standing White Oak. Digging down at the inner side of the circle we found that the deceptive sprouts were attached to roots, often 3–6 cm. in diameter, of the large tree. Such sprouting of *Quercus alba* is not mentioned in any discussions of the species which have come to hand. It is represented by our nos. 12,314 and 12,998.

*× Quercus Fernowi Trelease (*Q. alba* × *stellata*). Nansemond County: dry sandy woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, no. 13,321, a small shrubby tree less than 2 m. high, presumably derived in part from one of the smaller extremes of *Q. stellata*.—A hybrid previously recorded from the District of Columbia, Missouri and Alabama.

*Q. lyrata Walt., forma viridis Trelease. Prince George County: river-swamp of Blackwater River, north of Disputanta, no. 5762. Dinwiddie County: alluvial woods near head of Old Town Creek, northwest of Petersburg, no. 6190. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, no. 5761.

Ordinarily *Quercus lyrata* has the leaves permanently whitish to gray beneath with minute tomentum. The numbers cited above have the lower surfaces glabrous and green. Although Trelease's description is merely in a key, "Leaves green beneath . . . f. *viridis*" and he accompanies it by no citation of specimens, I assume that trees like the above are what he intended.

Q. palustris DuRoi. Range extended southward into Greensville County: bottomland woods along Meherrin River, northeast of Gaskins, no. 13,000. To be expected in North Carolina, farther down-river. See p. 349.

Q. nigra L., var. tridentifera Sargent. To the single Virginia station (Suffolk) cited by Sargent in Bot. Gaz. lxv. 429 (1918) add the following from Norfolk County: dry woods west of Bethel Church, Gertie, nos. 13,929 and 13,930; dry woods east of Cedarville, no. 13,932. Greensville County: along a seepy old woodroad north of Dahlia, no. 9912, distrib. as *Q. nigra* × *Phellos*. See p. 369.

Sargent, Man. Trees N. Am. ed. 2: 261 (1922) speaks of "var. *tridentifera* Sarg. rare and local; southwest Virginia to Alabama", etc. Noting in passing that Suffolk, cited with the original description, is in southeastern (not "southwest") Virginia, we got the impression that var. *tridentifera*, which often has some simple and narrowly oblong to oblanceolate leaves below the deeply 3-cleft upper ones, is the result of crossing of *Q. nigra* and *Q. Phellos*.

*Q. Phellos L., forma **intonsa,** f. nov., foliis subtus semper sericeo-tomentulosis, pilis albidis vel cinereis.—Delaware: near Wilmington, *Canby*. Virginia: large tree in dry woods by York River, above Mt. Folly, York County, July 28, 1941, *Fernald & Long*, no. 13,324 (type in Herb. Gray., isotype in Herb. Phil. Acad.); swampy woods southeast of Joyner's Bridge, Isle of Wight County, July 17, 1940, *Fernald & Long*, no. 12,328.

Quercus Phellos commonly has the leaves glabrous or, if pubescent upon unfolding, promptly glabrate. Sargent, Sylva, viii. 179 (1895), cites the Canby specimen in the Gray Herbarium as the only one he had ever seen with the leaves permanently pubescent beneath. The tree below Joyner's Bridge had fallen and was thought to be perhaps not normal in its foliage. The large tree above Mt. Folly is sturdy and fertile; there is no question of its virility.

*Polygonum tenue Michx., var. **protrusum,** var. nov. calycibus maturis 1.5–2 mm. longis, sepalis exterioribus rotundato-ovatis quam interioribus duplo longioribus; achaeniis nigricantibus valde exsertis.—Virginia: dry sand of gravel-pit near Blackwater River, southeast of Ivor, Southampton County, October 16, 1941, *Fernald & Long*, no. 13,937 (type in Herb. Gray.; isotype in Herb. Phil. Acad.). Notable for the very short calyx with broad and rounded sepals and the strongly exserted black achene.

*P. sagittatum L., var. **gracilentum,** var. nov., foliis anguste lanceolato-sagittatis, primariis 3.5–6.5 cm. longis 5.5–10.5 mm. latis, superioribus valde reductis; internodiis superioribus perlongis superne laevibus.—Fresh to brackish tidal marshes, southeastern Virginia: brackish marsh along Piscataway Creek, northwest of Dunnsville, Essex County, August 1, 1941, *Fernald & Long*, no. 13,331 (type in Herb. Gray., isotype in Herb. Phil. Acad.); fresh tidal marsh by Lacey Creek, west of Walker, New Kent County, September 9, 1941, *Fernald & Long*, no. 13,602 (transitional); fresh tidal margin of Chickahominy River, near Cypress Bank Landing, Charles City County, September 9, 1941, *Fernald & Long*, no. 13,602. See p. 353.

Typical *Polygonum sagittatum* L. (var. *americanum* Meisner) has oblong- to narrowly ovate-lanceolate leaf-blades, the primary ones ranging from 1.3–10 cm. long and 0.7–2.8 cm. broad, averaging two-fifths as broad as long, the upper ones well developed; the upper internodes are retrorsely barbed essentially to summit and not conspicuously elongate. In var. *gracilentum* the upper internodes are much longer than the lower and median ones, 8–14 cm. long, smooth (except sometimes toward base); and the narrow lanceolate leaves average one sixth as broad as long, the uppermost becoming reduced to tiny bracteiform blades.

*Chenopodium Berlandieri Moq. Dinwiddie County: abundant and spreading from a freight-yard, Petersburg, no. 13,941. Greensville County: railroad-yard, North Emporia, no. 9320 (distrib. as *C. album* L., var. *viride*). A southwestern species, now casually naturalized from South Carolina to New England.

*C. paganum Reichenb. King William County: border of cultivated field, Cohoke, no. 12,646. Although cited by Standley in N. Am. Fl. xxi[1]. 23 (1916) as found "throughout the United States", there is no previous material in the Gray Herbarium from the Atlantic States from south of the District of Columbia.

*C. Botrys L. Henrico County: waste places and railroad ballast, South Richmond, no. 12,643. Although stated by Standley, l. c. 26, to occur "in nearly all parts of the United

States", we have found no record of it as definitely in Virginia, nor are there previous specimens in the Gray Herbarium from the Atlantic States south of Maryland and the District of Columbia.

*C. ambrosioides L., var. chilense (Schrad.) Spegaz. (*C. vagans* Standl.). Often abundant as a coarse weed of cultivated ground, waste places and roadsides, from Prince George County to southern Southampton County. Our specimens are from Courtland, nos. 8252, 8707 and 9046. See p. 362.

Typical and now wide-spread *Chenopodium ambrosioides*, originating in South America but now generally dispersed in warm and temperate countries, has the stems and leaves glabrous or merely waxy-pruinose. It is relatively infrequent in eastern Virginia, where the white-villous or hirsute var. *chilense* abounds. Schrader's original description of *C. chilense* called for "caule hirto", etc., and, although he described it as annual, the plant in Virginia may become a strong perennial with coarse and deep roots. It has recently (1940) been collected in Randolph County, West Virginia (*J. C. Tosh*, no. 404); and Mr. Long informs me that it has just appeared in eastern Pennsylvania. It is also known from California. When treated as a species, merely on its pubescence, it is *C. vagans* Standl. (1916), substitute for *C. chilense* Schrad. (1832), not Pers. (1805). When it was made a variety by Spegazzini in 1902, he kept Schrader's name for the variety, as he had a right to do. I am taking the name var. *chilense* for the plant with cuneate lanceolate to oblong leaves as defined by Schrader and later by Moquin in DC. Prodr. xiii². 74 (1849). A minor form "foliis minoribus angustissimis" was called by Moquin *C. chilense*, β. *angustifolium* Moq. l. c., based upon a plant cultivated in Paris. Although this name is earlier in the varietal category than var. *chilense*, its application to our plant is too doubtful. It is called by Aellen *C. ambrosioides*, subsp. *chilense* (Schrad.) Aellen, var. *eu-chilense* Aellen, forma *angustatum* Aellen in Fedde, Repert. Spec. Nov. xxvi. 36 (1929).

*Portulaca grandiflora Hook. Essex County: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,332, a stray from cultivation. See p. 354.

Submersed Leaves of Nuphar advena (Plate 717, fig. 1).—As it characteristically grows in the fluctuating water-levels and regularly exposed muds of our tidal estuaries, *Nuphar advena*

(Ait.) Ait. f. has the ovate to suborbicular leaf-blades erect and borne well above all but the highest tides. In this, one of its most characteristic habitats, only the firm and promptly emersed blades are developed. In their descriptions of many species with floating blades, *Nuphar microphyllum* (Pers.) Fern. (*Nymphaea microphylla* Pers.), *N. rubrodiscum* Morong (*Nymphaea rubrodisca* (Morong) Greene), *N. variegatum* Engelm. (*Nymphaea variegata* (Engelm.) G. S. Miller), *N. sagittifolium* (Walt.) Pursh (*Nymphaea sagittifolia* Walt.), etc., Miller & Standley in their detailed monograph, *The North American Species of Nymphaea*, Contrib. U. S. Nat. Herb. xvi. pt. 3 (1912), regularly described the filmy submersed leaves; but under *Nuphar advena* they did not mention them, correctly saying merely "Leaves erect, usually borne above the surface of the water, occasionally floating in deep water; blades . . . thick and firm". This is the situation in all the tidal margins of streams where Mr. Long and I have watched the plants in Virginia; when young plants are found in the tidal mud they have the submersed leaves quite like the full-grown emersed ones, only smaller.

In fresh rills, springy swales and shallow fresh ponds of James City County, Virginia, a relatively small-leaved plant with blades usually erect, the sinus as in *Nuphar advena* but the blades often nearly orbicular, though no more so than in some estuarine specimens, greatly puzzled us in the field. Study of it shows it to have the very numerous stamens (5–8 rows), the rays of the greenish disk and the other characters of *N. advena*. Its rhizomes are more slender and with more crowded scars and teeth than in the plant of tidal mud, but this may well be an environmental point. In the shallow pond-hole slightly east of Centerville this small-leaved *N. advena* abounds, the plants near shore with erect blades, those in deeper water with them floating; best of all, young plants in this relatively stable aquatic habitat develop filmy and translucent leaves (PL. 717, FIG. 1), in shape like the emersed ones but as flaccid as in the species which normally produce them. The series from fresh waters and swales is as follows, all from

JAMES CITY COUNTY: swampy thicket, Chisel Run, northwest of Williamsburg, no. 13,337 (leaves erect); swale at head of Chisel Run, clearing in woods south of Ewell, no. 13,338 (blades erect); shallow peaty pond-hole ½ mile east of Centerville, no.

13,339 (blades floating or erect; filmy submersed leaves developed); muddy swale, Long Hill Swamp, east of Centerville, no. 13,340 (blades erect). See p. 358.

Nuphar sagittifolium in Virginia (Plate 718).—Along with the small boreal *Nuphar microphyllum*, with its nearly filiform petioles, narrow sepals, promptly deciduous petals and stamens, naked-based fruit and small stigmatic disk, another species, *N. sagittifolium* (Walt.) Pursh of southeastern North Carolina and northeastern South Carolina stands apart from the less easily recognized eastern American species of the genus. After prolonged field-study and examination of living, unpressed, and pressed material, the latter from all the larger American herbaria, Miller & Standley op. cit. 96, were able to cite it (as *Nymphaea sagittifolia*) only from the Coastal Plain of North Carolina, in the drainage system of the Cape Fear River from Fayetteville to the Wilmington region, and from Georgetown, South Carolina, summarizing their findings in the significant note: "It is exceedingly improbable that the species is found outside the States of North and South Carolina. We have seen no specimens from other States nor have we any information that clearly indicates the plant's occurrence elsewhere". Later collections have greatly increased the number of stations represented from North Carolina but they are all in a restricted area: from the Waccamaw and Little Pee Dee Rivers in northeastern South Carolina to the Cape Fear drainage, from Columbia County to the sea, in southeastern North Carolina. To this area should, perhaps, be added that of *Nymphaea ulvacea* Miller & Standley, described from Santa Rosa County in northwestern Florida. At least, I fail to get the sharp lines I should like between an isotype of *Nymphaea ulvacea* and specimens from the Lumber and Little Pee Dee systems in Scotland and Robeson Counties, North Carolina and in Horry County, South Carolina. In fact, these Carolina collections show that the emersed or floating blades may sometimes be of even broader outline than in the type of *N. ulvacea.*

So deeply rooted has become the view that *Nuphar sagittifolium* is confined to a restricted area, only 130 miles broad from north to south, in the Carolinas, that it has not been realized that it abounds within 100 miles of Washington and nearly 200

miles north of its supposed northern limit. In the Chickahominy River, however, from head of tide below Providence Forge for about 15 miles down-river, very characteristic *N. sagittifolium* (PL. 718, FIGS. 1–3) forms a continuous belt at mid-stream, the floating leaves 3–4 dm. long, 7–11 cm. wide. The Carolina material shows the floating leaves to range from 1.8–4 dm. long and 5–7.5 cm. broad, while emersed blades (on stranded plants) may be narrowly ovate and only 0.7–2 dm. long. In the Chickahominy, *N. sagittifolium,* so far as we yet know, is only near the head of tide, the long blades pointing up-stream as the tide comes in, down-stream as it goes out.

The broad tidal marshes of the Chickahominy are covered down to the low-tide level with typical erect-leaved *Nuphar advena*, with broad-ovate to subrotund blades and no filmy submersed leaves. In the broad belt between the marsh-area of *N. advena* and the mid-stream belt of *N. sagittifolium,* with narrow floating leaves and *Ulva*-like lanceolate translucent submersed ones, there are broad areas of a plant (PL. 719) with floating leaves (FIG. 1) narrowly ovate to oblong, shorter than but much broader than in *N. sagittifolium,* with beautiful masses of broad-oblong submersed leaves (FIG. 2), again broader and shorter than in *N. sagittifolium* and quite unlike the rarely translucent, submersed ovate blades of *N. advena.* Repeated search showed that, whereas both *N. advena* and *N. sagittifolium* mature plenty of good fruit, this common intermediate plant of the Chickahominy only rarely develops well filled capsules (FIG. 4). It is so clearly a hybrid of the two that I am so designating it below.

*NUPHAR SAGITTIFOLIUM (Walt.) Pursh. NEW KENT COUNTY: deep fresh tidal water of Chickahominy River, southeast of Windsor Shades (Boulevard Postoffice), no. 13,335. CHARLES CITY COUNTY: similar habitat, near Cypress Bank Landing, no. 13,334. See p. 357.

* × NUPHAR **interfluitans,** hybr. nov. (*N. advena* × *N. sagittifolium*). TAB. 719. Planta inter *N. advena* et *N. sagittifolium* intermedia; laminis natantibus firmis opacis anguste ovatis vel ovato-oblongis 2–4 dm. longis 0.9–1.8 dm. latis obtusis sino acuto; laminis submersis flaccidis translucentibus, laminis petiolisque subaequantibus, late oblongis vel oblongo-ovatis 2–3.5 dm. longis 0.7–1.8 dm. latis margine crispatis apice rotundato sino late rotundato; floribus ut in *N. sagittifolium;* staminibus 3–5-

seriatis; disci viridiscentibus, radiis 8–10 lineari-lanceolatis attenuatis; capsulis rare distentis globoso-urceolatis.—Virginia: growing in a broad band between mid-stream and margin of Chickahominy River, intermediate in position between *N. advena* of the tidal marshes and *N. sagittifolium* of mid-current. New Kent County: deep fresh tidal water, southeast of Windsor Shades (Boulevard Postoffice), September 9, 1941, *Fernald & Long*, no. 13,607 (type in Herb. Gray.; isotype in Herb. Phil. Acad.). Charles City County: similar habitat, near Cypress Bank Landing, July 26, 1941, no. 13,336, and September 11, 1941, no. 13,700. See p. 357.

Very rarely fruiting, most of the ovaries shriveling. Differing from the erect-leaved *N. advena* in its narrower floating leaves (pl. 719, fig. 1) with narrower sinus, in the abundant filmy and translucent submersed leaves of narrower outline (fig. 2) than in the rare submersed leaves of *N. advena* (pl. 717, fig. 1), in the more slender rays (pl. 719 fig. 3) of the disk and, viewed from above, in the greater uniformity in length of the rows of anthers (pl. 719, fig. 3). In *N. sagittifolium* the submersed leaves (pl. 718, fig. 2) and the floating leaves (pl. 718, fig. 1) are much narrower and with narrower sinuses; the rings of stamens, viewed from above being similar (pl. 718, figs. 3 and 4).

Plate 717 is of Nuphar advena: fig. 1, young plant with translucent filmy submersed leaves, × 1, from east of Centerville, Virginia, *Fernald & Long*, no. 13,339; fig. 2, flower aid partly open to show cone of young stamens, × 1, from no. 13,339.

Plate 718, of N. sagittifolium: fig. 1, floating leaf, × 3/7, from Chickahominy River, Virginia, *Fernald & Long*, no. 13,334; fig. 2, submersed leaf, × 3/7, from no. 13,334; fig. 3, flower partly opened to show stamens, × 1, from Chickahominy River, no. 13,334; fig. 4, flower, partly opened to show stamens, × 1, from Wilmington, North Carolina, 1858, *McRee.*

Plate 719, × N. interfluitans, all from the type: fig. 1, floating leaf, × 2/5; fig. 2, submersed leaf, × 2/5; figs. 3 and 4, flower and fruit, × 1.

*Aconitum uncinatum L., var. **acutidens,** var. nov. (tab. 720, fig. 2–4), foliorum foliolis cuneatis apice acuminatis acute subinciseque serratis.—Mountains of western Maryland to those of North Carolina and Tennessee; inner Coastal Plain of southeastern Virginia. The following are characteristic: Maryland: Oakland, Garrett County, September, 1881, *J. D. Smith.* Virginia: mts., 1843, *Asa Gray et al;* Bedford County, October 6, 1871, *A. H. Curtiss;* rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, Southampton County, May 7, 1940, foliage, *Fernald & Long*, no. 11,652; rich woods along brook entering Nottoway River below Double Bridge, north of Orion, Greensville County, June 13, 1940, foliage, *Fernald & Long*, no. 12,079, August 21, 1940, foliage, no. 12,654,

September 14, 1941, young flower-buds, no. 13,613, October 13, 1941, flowers very scarce, no. 13,945 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). NORTH CAROLINA: shady banks, Biltmore, September 9, 1897, *Biltmore Herb.*, no. 72[a]; wet rocks, "Pink Beds", 4000 feet alt., Pisgah Forest, September 1, 1908, *House*, no. 4001; rich ravines, alt. 5000 feet, Great Smoky Mountains, Swain County, August 18, 1891, *Beardslee & Kofoid.* TENNESSEE: deep woods along "K. and N. G. R. R.", October 2, 1902, *Ruth*, no. 389; along brooks on western slopes of Mt. LeConte, alt. 4500 feet, August 12, 1930, *Svenson*, no. 4037. See p. 374.

Typical *Aconitum uncinatum* L. Sp. Pl. ed. 2, i. 750 (1762) is the extreme of the species which early reached European gardens. Its middle and upper leaves (FIG. 1) have broader and less cuneate and less acuminate leaflets or divisions, these with shorter and blunter teeth, the plant illustrated in Bot. Mag. xxviii. t. 1119 (1808). Its leaves were described by Linnaeus "*Folia triloba s. quinqueloba, angulato-dentata*" but, although he gave the "*Habitat in* Philadelphia" it is not now admitted as a native of that city. It seems, however, to be a plant usually of lower altitudes than var. *acutidens:* low woods, near Great Falls, Virginia; "*In vicinis* Washington, D. C."; Falls of Saluda River, Greensville Co., South Carolina; etc. In southeastern Virginia it occurs in HENRICO COUNTY: woods, campus of University of Richmond, October 10, 1931, *J. T. Johnson.*

In PLATE 720, FIG. 1 is a characteristic leaf of typical A. UNCINATUM, × 1, from Great Falls, Virginia, September 24, 1915, *Holm;* FIGS. 2–4, flowering tip and characteristic portions of leaves, × 1, of type and topotypes of var. ACUTIDENS.

*PERSEA PALUSTRIS (Raf.) Sarg., forma **laevifolia,** f. nov., foliis subtus glabris vel subglabris.—Nansemond County, VIRGINIA: wet woods near lumber camp of Camp Lumber Co., Great Dismal Swamp, southeast of Whitmarsh School, July 19, 1939, *Fernald & Long*, no. 10,652 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); woods and thickets back of sandy western shore of Lake Drummond, Great Dismal Swamp, September 15, 1941, *Fernald & Long*, no. 13,616; swampy depressions in pine barrens northeast of Sandy Landing, south of South Quay, August 27, 1939, *Fernald & Long*, no. 11,039. See p. 366.

. Typical and, in southeastern Virginia, common *Persea palustris* has the leaves densely soft-pubescent to tomentulose beneath; forma *laevifolia* has the lower surface as smooth as or smoother than in *P. Borbonia* (L.) Spreng., but the outline of the leaf is

that of *P. palustris*. No fruiting trees of the glabrescent form have yet been found but it is improbable that they will show material departure from *P. palustris*. In making the combination *P. palustris* (Raf.) Sargent in Bot. Gaz. lxvii. 229 (1919), Sargent based it on "*Tamala palustris* Rafinesque, Fl. Tellur. 137. 1838." When Flora Telluriana, a work published in several separately paged parts, is looked up we find no part with as many as 137 pages, and the last part, "pars iv et ult.", bears the date 1836 (now known to be 1838). *Tamala* is not in the index to any of the parts. So, having become familiar with the loose bibliography of both authors concerned, we search and eventually find that *Tamala palustris*, "fol. lanceol. subtus pallidis pubescens," etc., was published in Sylva Telluriana, 137 (1838). By our present easy-going practice, however, Sargent is accepted as author of the combination.

*Capsella gracilis Grenier. Prince George County: border of cultivated field near James River, Windmill Point, Flowerdew Hundred, no. 13,014; apparently the first record from North America. See p. 346.

*Cardamine Longii Fernald. Fresh tidal shores, especially in mud and among other taller vegetation; heretofore known only from the original stations on tidal mud of Sagadohoc County, Maine, whence it was introduced by the late Fayette F. Forbes to the lower Charles River in eastern Massachusetts. Recently found by Mr. Long on tidal mud at the head of Chesapeake Bay, near the mouth of the Susquehanna. Prince George County: James River, Windmill Point, Flowerdew Hundred, no. 13,015; James River, Jordan Point, no. 13,016. Charles City County: Chickahominy River, Cypress Bank Landing, no. 13,345. New Kent County: fresh tidal shore of Chickahominy River, above Lanexa, no. 13,017. King William County: Mattaponi River at Horse Landing, near King William Courthouse, no. 13,018; Mattaponi River, northwest of King William Courthouse, no. 13,019. King and Queen County: Mattaponi River, Walkerton, no. 13,020. Caroline County: Rappahannock River, northwest of Return, no. 13,947. See pp. 346, 347 and 356.

Arabis laevigata (Muhl.) Poir. Local range extended into James City County: rich wooded slopes by James River, Grove Landing, southeast of Grove, no. 13,346.

*Heuchera americana L., var. **heteradenia,** var. nov. (tab. 721, fig. 2 et 3) foliis magnis, laminis deinde 0.8–1.5 dm. longis paginis superioribus strigoso-pilosis; petiolis scapis rha-

Photo. B. G. Schubert.

Heuchera americana, var. subtruncata, × ½, fig. 1; var. heteradenia, × 4, figs. 2 and 3; var. hirsuticaulis, × 4, fig. 4; var. interior, × 4, fig. 5.

Photo. B. G. Schubert

RUBUS DEFECTIONIS. × 1.

Photo. B. G. Schubert.

Rubus dissitiflorus, × 1.

Photo. B. G. Schubert.

Cassia fasciculata, forma transmutata, fig. 1 × 1, fig. 2 × 3; forma mutata, fig. 3 × 3.

chibusque superne densissime hirsuto-glandulosis, glandibus valde inaequalibus 0.1–2 mm. longis; scapis 3–6 dm. altis; paniculis ad 4.3 dm. longis et 1.5 dm. diametro; calycibus regularibus in anthesi 3–4.5 mm. longis; petalis lineari-oblanceolatis paullo exsertis.—Calcareous bluffs along James River, Surry and Isle of Wight Counties, VIRGINIA: wooded calcareous bluffs by Cobham Bay, northwest of Chippokes, Surry County, June 10, 1941, *Fernald & Long*, no. 13,024; rich calcareous wooded slopes west of old Fort Boykin, Isle of Wight County, June 14, 1941, *Fernald & Long*, no. 13,026; seeping calcareous wooded bluffs by James River, west of old Fort Boykin, June 14 and 16, 1941, *Fernald & Long*, no. 13,027 (TYPE in Herb. Gray., ISOTYPE in Herb. Phil. Acad.). No. 13025, from west of old Fort Boykin is less hirsute, forming a transition to var. *typica* Rosendahl, Butters & Lakela. See p. 345.

*H. AMERICANA L., var. **subtruncata,** var. nov. (TAB. 721, FIG. 1), foliorum laminis membranaceis glabris (vel subtus sparsissime hirtellis) angulato-dentatis, basi subtruncatis; petiolis scapis rhachibusque glabris vel minute glanduloso-puberulis vel sparsissime hirtellis; calycibus regularibus in anthesi 3–3.5 mm. longis; petalis oblanceolatis paullo exsertis.—Henrico County, VIRGINIA: rich wooded slopes by James River, west of Varina, June 6, 1940, *Fernald & Long*, no. 12,092 (TYPE in Herb. Gray.); same station, June 19, 1941, *Fernald & Long*, no. 13,031. See p. 349.

Although, as pointed out by me in RHODORA, xliii. 495–497 (1941) and again, l. c. xliv. 39–41 (1942), the exact identity of *Heuchera americana* L. is not finally settled, nor can it be until after the present world-war. In the meantime it is better to accept the interpretation of Rosendahl, Butters & Lakela. As treated by them typical *H. americana* is a frequent plant of the Atlantic and Appalachian region with cordate leaves with glabrous to sparsely hirtellous petioles, glandular-puberulent scapes and rachises and calyx in anthesis 4–5.5 mm. long. It passes insensibly into the scarcely worth-while var. *brevipetala* Rosendahl, Butters & Lakela, separated because of its more elongate leaf-blades, smaller flowering calyx (3–3.5 mm. long) and sometimes shorter petals.

As already noted (RHODORA, xliii. 495) var. *truncata,* growing near typical *Heuchera americana,* has such thin leaves that the specimens of it were thoroughly dry after three days in press, whereas the neighboring specimens of var. *typica,* with heavy cordate blades, required two weeks of drying.

Var. *heteradenia*, in its extreme development, suggests var. *hirsutissima* (Wheelock) Rosendahl, Butters & Lakela, of Indiana, Illinois and Missouri and var. *interior* Rosendahl, Butters & Lakela, of somewhat broader range in the Interior (to Tennessee and Arkansas); but the pubescence of the petioles in these inland extremes is very much looser and longer (fig. 4, var. *hirsutissima;* fig. 5, var. *interior*) than in the James River plant, that of var. *hirsutissima* up to 5 mm. long; the leaves of var. *interior* are definitely longer than broad; and its flowering calyx usually less than 3 mm. long. Var. *hirsutissima*, although with flowering calyx as large as in var. *heteradenia*, has the limb definitely oblique, instead of quite regular.

In plate 721 fig. 1 is the type of Heuchera americana, var. subtruncata, × ½; figs. 2 and 3, portions of rachis and scape, × 4, from type of var. heteradenia; fig. 4, portion of scape, × 4, of type of var. hirsutissima; fig. 5, base of petiole, × 4, of var. interior, from Pine Hills, Union County, Illinois, May 6, 1902, *Gleason.*

Rubus Janssonii Bailey. Although the inflorescences usually have several flowers and fruits, colonies with solitary (rarely 2) flowers or fruits occur. These seem otherwise quite like typical *R. Janssonii.* Such 1-flowered variants are the following. Prince George County: thickets and wood back of beach of James River, Windmill Point, Flowerdew Hundred, no. 13,046. Southampton County: border of sandy woods south of Applewhite's Church, no. 13,045.

*R. recurvans Blanchard. Although, merging *R. recurvans* with the unidentified *R. heterophyllus* Willd., Bailey, in Gent. Herb. ii. 421 (1932), gives the range "from Quebec and Nova Scotia to New York and apparently Virginia, Minnesota, Iowa, Missouri", it is well to give a positive citation for Virginia. Greensville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, no. 13,051; the material, with arching and intricately branched canes and jagged-serrate leaves soft-pilose beneath, closely matching specimens from Nova Scotia and New England. We should not have looked for a wide-ranging northern species at the inner margin of the Virginia Coastal Plain, only a few miles from North Carolina. See p. 348.

R. floridus Tratt. Range extended northward to Surry County: border of dry woods near James River, west of Ingersoll, no. 13,050. Fruit large, of superior quality.

*R. (§ *Arguti*, subsect. *Frondosi*) **defectionis,** sp. nov. (tab. 722). Arcuans; primocannis 0.6–1.5 m. altis rigidis ad basin 3.5–5 mm. diametro glabris armatis, aculeis subulatis

deflexis 2–4 mm. longis basi compressis 2.5–4 mm. latis; primocannae foliis 3- vel 5-natis petiolo sparse piloso glabrato armato; foliolis ovatis abrupte breviterque acuminatis supra glabratis subtus subvelutinis margine adpresso-serratis; foliolo terminali 5–6.5 cm. longo 2.5–4 cm. lato basi rotundato; floricannis valde ramosis ramis divergentibus; foliolis anguste cuneato-obovatis vel -subrhomboideis 2–4 cm. longis; corymbis 2–4-floris; pedicellis adscendentibus, filiformibus 1–2.5 cm. longis breviter pilosis plus minusve glandulosis; calycibus maturis pilosis, lobis anguste ovatis 4 mm. longis apice mucronatis valde reflexis; fructibus subglobosis 1.2–1.5 cm. diametro.—Nansemond County, VIRGINIA: forming an extensive thicket at the base of a dry wooded bank by James River, Eclipse, June 20, 1941, *Fernald & Long*, no. 12,047 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). See p. 348.

Rubus defectionis (from *defectio*, an eclipse) is obviously related to *R. pauxillus* Bailey, Gent. Herb. ii. 415, fig. 180 (1932), described from Stafford, Spotsylvania and Surry Counties. It shares with that species the slender habit, small leaves and glandular pedicels. *R. pauxillus*, however, is said to be only 1 to 2 feet (3–6 dm.) high, erect and unbranched; *R. defectionis* is 0.6–1.5 m. high, strongly arching and with horizontal branching. *R. pauxillus* has the terminal leaflet of the primocane-foliage broadly rounded at base and only about 4 cm. long; in *R. defectionis* it is less broadly ovate and 5–6.5 cm. long. In *R. pauxillus* the leaflets of the floricane-foliage are, as illustrated by Bailey, ovate and short-acuminate; in *R. defectionis* cuneate-obovate or -subrhombic and less sharply pointed.

*R. (§ *Arguti*, subsect. *Anormi*) **dissitiflorus,** sp. nov. (TAB. 723). Erectus; primocannis 4.5–5 dm. altis olivaceis glabris 2–3 mm. diametro valde armatis, aculeis pallidis unguiculatis 2–3 mm. longis subulatis basi compresso 2–3 mm. latis; primocannae foliis ternatis submembranaceis supra strigoso-pilosis, subtus subvelutinis, petiolo glabro vel glabrato valde armato, foliolis anguste ovatis dentato-serratis, dentibus obtusis vel subacutis, subacuminatis; foliolo terminali 5–6 cm. longo 2.7–3.7 cm. lato, petiolulo armato glabro 1–1.3 cm. longo; foliolis lateralibus basi sublobatis; floricannis breviter ramosis, ramis suberectis; foliolis oblongo-ellipticis vel rhomboideo-ellipticis obtusis vel subacutis 3–5.5 cm. longis; pedicellis solitariis axillaribus erectis filiformibus pilosis 2–4 cm. longis aculeatis aculeis divergentibus; calycibus maturis pilosis, lobis adpresso-erectis ovatis 6–7 mm. longis; fructibus vix 1 cm. diametro.—Isle of Wight County, VIRGINIA: seeping calcareous wooded bluff by

James River, west of old Fort Boykin, June 14 and 16, 1941, *Fernald & Long*, no. 13,052 (TYPE in Herb. Gray.). See p. 345.

Rubus dissitiflorus is, apparently, the first member of subsection *Anormi* found in the eastern states north of Florida. It strongly suggests *R. lucidus* Rydb. of Florida; but that species has the taller canes with prolonged and weak horizontal branches, so that the plant becomes subprostrate, the lustrous leaves glabrous above and nearly so beneath, the primocane-foliage 5-foliolate, the flowers several, and calyx-lobes promptly reflexed. *R. tallahasseanus* Bailey likewise has the primocane-leaves 5-foliolate and the fruiting calyx reflexed; it is a trailing plant. *R. oklahomus* Bailey of Oklahoma is, like *R. dissitiflorus*, erect and with 3-foliolate primocane-foliage, but it has the mature calyx reflexed, the leaflets pilose beneath only on the veins, the flowers several on each lateral spur.

We have not yet found the real home of *Rubus dissitiflorus*. The solitary individual collected was in a habitat most unusual for a blackberry, in wet calcareous marl. Search revealed no other specimen there and it is presumable that the TYPE-SPECIMEN was a stray individual derived from dry woods or clearings somewhere back of the river-bluffs. So interesting and isolated a species must be sought in the neighborhood.

*Gymnocladus dioica (L.) Koch. Caroline County: many trees naturalized on steep wooded bluff by Rappahannock River, northwest of Return, no. 13,956. See p. 372.

Cassia Tora L. Greensville County: sandy roadsides and borders of cultivated fields near Meherrin River, northeast of Gaskins, no. 13,352; our first collection in southeastern Virginia. See p. 360.

*C. fasciculata Michx., forma **transmutata**, f. nov. (TAB. 724, FIG. 1 et 2) inflorescentiis dense glomerulatis, floribus ad bracteos imbricatos confertosque transmutatis.—Norfolk County, Virginia: in dense cane (*Arundinaria*)-scrub north of Cornland, October 17, 1941, *Fernald & Long*, no. 13,955 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); FIG. 1 is × 1; FIG. 2, × 3.

An extraordinary sterile mutation of the common *Cassia fasciculata*, with dense and forking glomerules of flowers reduced to strongly ribbed bracts and bractlets. The plant was growing in most adverse conditions, in dense cane-scrub, where the roots were forced to strike into the crowded mass of rhizomes. Wheth-

er it is the result of this most trying habitat or, perhaps, of nematode-attack, it is so unusual an aberration in *Cassia* as to merit minor recognition and illustration.

*C. FASCICULATA Michx., forma **mutata,** f. nov. (TAB. 724, FIG. 3), foliis impari-pinnatis foliolis 3 vel 5.—Nansemond County, VIRGINIA: roadside by swampy woods north of Whitemarsh School, July 19, 1939, *Fernald & Long*, no. 10,685. TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). FIG. 3 is × 3.

In its way as eccentric a deviation from normal *Cassia fasciculata* as the preceding. *Cassia,* theoretically, has abruptly pinnate leaves and typical *C. fasciculata* should have 20 or more leaflets. The plant here called forma *mutata* has odd-pinnate leaves, with 3 or 5 leaflets, thus completely departing from the generic pattern as well as from that of the species. The terminal odd leaflet, however, is enlarged and appears to be two leaflets fused. A single individual was found in the disturbed soil of a roadside fill and, although not yet fruiting, was taken, with the supposition that it was a member of some genus new to the flora of Virginia. Two later visits to the locality have failed to reveal another plant; and examination shows the eccentric individual to have the bracts, leaflets and petiolar gland, as well as the venation of the leaflets of typical *C. fasciculata.* It is a remarkable aberration. Its occurrence in a new "soft shoulder" is a tribute to the well known potency of disturbed soil in stimulating abrupt mutations.

(*To be continued*)

GEUM TRIFLORUM Pursh.—The question has been raised again as to which is the valid name when *Geum triflorum* Pursh and *G. ciliatum* Pursh are united. Each has been treated under the other as a synonym, but the authority for the first such combination has not been clearly stated, so far as the writer knows.

Prof. M. L. Fernald and Mr. C. A. Weatherby of the Gray Herbarium were appealed to, and a search of the literature revealed that Sereno Watson combined them as *Geum triflorum* Pursh in his Bibliographic Index in 1878. He gives as a reference, Prodromus Monographiae Georum by N. J. Scheutz, published in 1870. On page 53 Scheutz gives *G. ciliatum* as a synonym of G. TRIFLORUM. A search of the literature at the Gray Herbarium

shows this apparently to be the first combination of the two names.—Ray J. Davis, University of Idaho (Southern Branch), Pocatello, Idaho.

New Range-records for linear-leaved Species of Potamogeton.—During a study of the broad-leaved North American species of *Potamogeton* a number of collections of linear-leaved species of this genus have come to my attention. A few of these, not seen by Fernald nor St. John previous to the publications of their treatments on this portion of the genus, seem worthy of mention:

P. latifolius (Robbins) Morong. Texas: abundant in still water, 15 miles north of Brownsville, July 1, 1929, *Robert Runyon* no. 211 (U. S. Nat'l Herb.). Not previously reported from Texas and over 800 miles from the nearest station reported by St. John, Rhodora **18:** 130 (1916).

P. epihydrus Raf. var. typicus. South Dakota: Squaw Creek, Custer State Park, Black Hills, Aug. 23, 1926, *H. E. Hayward* no. 600 (New York Bot. Gard., Field Mus.). Neither of the varieties of *P. epihydrus* is listed from this state by Fernald, Mem. Am. Acad. Arts & Sci. **17,** pt. 1 (1932). The species, with no variety designated, is listed in Over's Flora of South Dakota, p. 15 (1932) for the eastern part of the state.

P. epihydrus var. Nuttallii (C. & S.) Fernald. Louisiana: near Jackson, Herb. of *J. L. Riddell* no. 1524 (New York Bot. Gard.). If the label is correct, this is an interesting southern extension for this species. Nevada: in ditches, Reno, July 19, 1919, *Ivar Tidestrom* no. 10622 (U. S. Nat'l Herb.). Apparently the first record for the state as, through a misidentification of the specimen, the species was not listed in Tidestrom's Flora of Utah and Nevada (1925) and the specimen was not sent to Professor Fernald during his study of the group. British Columbia: Dick's Lake, Sooke, Vancouver Island, Aug. 2, 1893, *Macoun* no. 4363 (Nat'l Mus. Canada); Stanley Park, Vancouver, Aug. 28, 1893, *Macoun* no. 4361 (Nat'l Mus. Can.); Griffin Lake, Aug. 5, 1889, *Macoun* no. 2971 (Nat'l Mus. Can.). Fernald cites no specimens of either variety of the species from British Columbia, as the three collections mentioned were not seen by

him. Kermode's Catalogue of the Flora of Vancouver and Queen Charlotte Islands (1921) lists the species, without mention of variety, from Quamichan Lake, V. I., referring to Glendenning's Annotated Check List of the Flowering Plants and Ferns of the Cowichan District, Vancouver Island. ALASKA: Kodiak Island, July 20, 1899, *Trelease & Saunders* (coll. T) no. 2866 (U. S. Nat'l Herb.); Kukak Bay, Alaska Peninsula, July 5, 1899, *Trelease & Saunders* (coll. S) no. 2868 (U. S. Nat'l Herb.). The most northerly locality cited by Fernald (1932) and by Hultén, Flora of Alaska and Yukon (1941) is in the Revillagigedo Islands in extreme southern Alaska.—E. C. ODGEN, University of Maine.

FASCIATION IN LILIUM CANADENSE.—A most interesting example of fasciation in *Lilium canadense* was found near the Weir River in Hingham by Miss Lenora Comiskey (July, 1942). The stalk was over five feet tall. Near the bottom the flattened stalk was 7 mm. thick by 18 mm. wide; just below the inflorescence it had thinned to 4 mm. in thickness and 24 mm. in width.

When collected the plant bore 44 blossoms slightly smaller than the normal size, and there were remains of six or seven other flowers which had ripened off. Several of the flowers had evidently been fertilized, as some of the ovaries made considerable growth after the flowers had faded. A color photograph of this unusual lily cluster was taken by Dr. John B. May.—CLARENCE HINCKLEY KNOWLTON, Hingham, Mass.

EUPHORBIA GEYERI IN INDIANA.—According to Wheeler[1] *Euphorbia Geyeri* Engelm has been unrecorded from Indiana, although three stations are reported from Illinois. On July 22, 1942, I found a colony on railroad ballast and spreading somewhat beyond in the extreme eastern part of Gary, Lake Co. The plants were so limited in area that introduction would seem to be very recent. Like the petals of *Trillium grandiflorum* the appendages of the glands, at first white, seem to turn red with age. Material has been sent to the Gray Herbarium, the Herbarium

[1] *Euphorbia Subgenus Chamaesyce in Canada and the United States Exclusive of Southern Florida.* RHODORA 43: 130–132. 1941.

of the Field Museum of Natural History, and the Herbarium of Indiana University.—Edwin D. Hull, Gary, Indiana.

Ranunculus abortivus L., forma **coptidifolius,** forma nova, foliis caulinis ternatis, foliolis rhomboideo-obovatis vel late flabelliformibus plerumque longe petiolulatis.—Pennsylvania: rich woods near stream, 5/8 mile southwest of junction of Big and Little Conestoga Creeks, Lancaster County, May 17, 1939, *Louise F. A. Tanger*, no. 3109 (type in Herb. Phil. Acad.).

Typical *Ranunculus abortivus* varies in its cauline leaves, sometimes with one or two of the lower ones with dilated leaflets or broad lobes, sometimes with the lower ones uncleft, but with the middle and upper ones divided into narrow, linear to lanceolate or lance-oblong leaflets or lobes; but Mrs. Tanger's plant is extraordinary in having all the cauline leaves (8 on the primary axis) from base to summit divided into 3 rhombic to oblate or fan-shaped broad leaflets, these mostly on elongate petiolules, the leaves, except for the long petiolules, strongly suggesting the outline of the foliage of *Coptis groenlandica* (Oeder) Fern.—M. L. Fernald.

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Acer floridanum: fig. 1, foliage and fruit, × 1; fig. 2, portion of inflorescence, × 3. Forma villipes: fig. 3, foliage and fruit, × 1.

Photo. B. G. Schubert.

ACER FLORIDANUM, var. LONGII: FIG. 1, flowering branch, × 1; FIG. 2, flowers, × 3; FIG. 3, fruiting branch, × 1.

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FOSSIL EVIDENCE OF WIDER POST-PLEISTOCENE RANGE FOR BUTTERNUT AND HICKORY IN WISCONSIN

L. R. Wilson and R. M. Webster[1]

The historic background of the present ranges of forest trees has not been fully explored by paleoecological studies of peat. At present there are probably over two hundred peat deposits that have been investigated in the United States and Canada, but a critical compilation of the data is difficult. The reasons which have prevented a thorough investigation of this sort are the unsatisfactory manner in which many of the studies have been reported, the probable errors in identification of certain fossils, and the difficulty in determining the historical age of many deposits. The recent "clock diagrams" by Smith and Sears (Sears, 1941), dealing with the migrations of certain forest elements, give a more related picture of the Quaternary forests than has heretofore been presented. Such studies appear very promising and should lead to the discovery of many interesting details of forest history.

While investigating the peats of northcentral Wisconsin the writers encountered fossil pollen of butternut (*Juglans cinerea*) and hickory (probably *Carya cordiformis*) in a bog that is now about fifty miles east of the present range of butternut and ninety miles north of the present range of hickory in that state. *Juglans* fossils occur vertically through three feet of peat and *Carya*

[1] From Coe College and the Limnological Laboratory of the Wisconsin Geological and Natural History Survey. Notes and reports No. 110.

through four feet. The fossil grains of these species are abundant in the peat even though they occur as a relatively small part of the total fossil count. They have not been found in the surface peat, which would be expected if the fossil pollen was wind-borne from the far distant locations of the present living trees. Therefore they strongly suggest a more eastern range for butternut and more northern range for hickory than is now evident on the maps published by Fassett (1932) depicting the extensions of range of modern species.

The difficulty in determining species of pollen in certain tree genera is well known to paleoecologists. Overlapping of size frequencies, variations in exine and structure within species, and differential preservation in peat all tend to make identification complex. Nevertheless, certain pollens in this study have been, temporarily at least, classified as to species. This has been done where good specific characters exist for the species in the region, or where only one species of the genus grows within or near the region of Vilas County, Wisconsin. *Juglans cinerea* and *Carya cordiformis* have characters which, according to Wodehouse (1935, pp. 355, 359), separate them from *Juglans nigra* and *Carya ovata*, the only other two species in Wisconsin having approximately the same geographic range; also, they are the northernmost species of their respective genera in Wisconsin.

The peat deposit reported here is located one and one-half miles north of Winchester, Vilas County, Wisconsin, in Section 5, Township 43 N., Range 5 E. The deposit is a few acres in extent and is six and one-half feet deep. The topography is morainal, and is described by Thwaites (1929) as part of the Winegar moraine [Wisconsin substage 4]. The soils in the immediate area are gravels, sandy loams, and clays. The virgin forest was white pine, hemlock, white birch, yellow birch, white spruce, hard maple, red oak, and basswood. Today, the forests are second growth trees consisting largely of white birch, aspen, and white pine. The bog has a partial cover of black spruce and a deep mat of *Sphagnum* moss over its surface. Other typical bog plants occur on it in abundance.

The peat samples were collected from the deepest part of the bog after it was thoroughly sounded. They were collected with a Davis peat sampler from vertical intervals of six inches. The

peat was prepared in the usual manner employed by paleoecologists and a statistical analysis was made of the fossils. A count of one hundred fossils was made at the basal level, and two hundred were counted at other levels, except at the one-foot level where fossils were very abundant and it was desirable to count three hundred. From these counts the percentages in Table 1 were determined, and the diagram (Fig. 1) was constructed. In addition to the fossils counted, the levels where the butternut and hickory were found were further studied to determine the

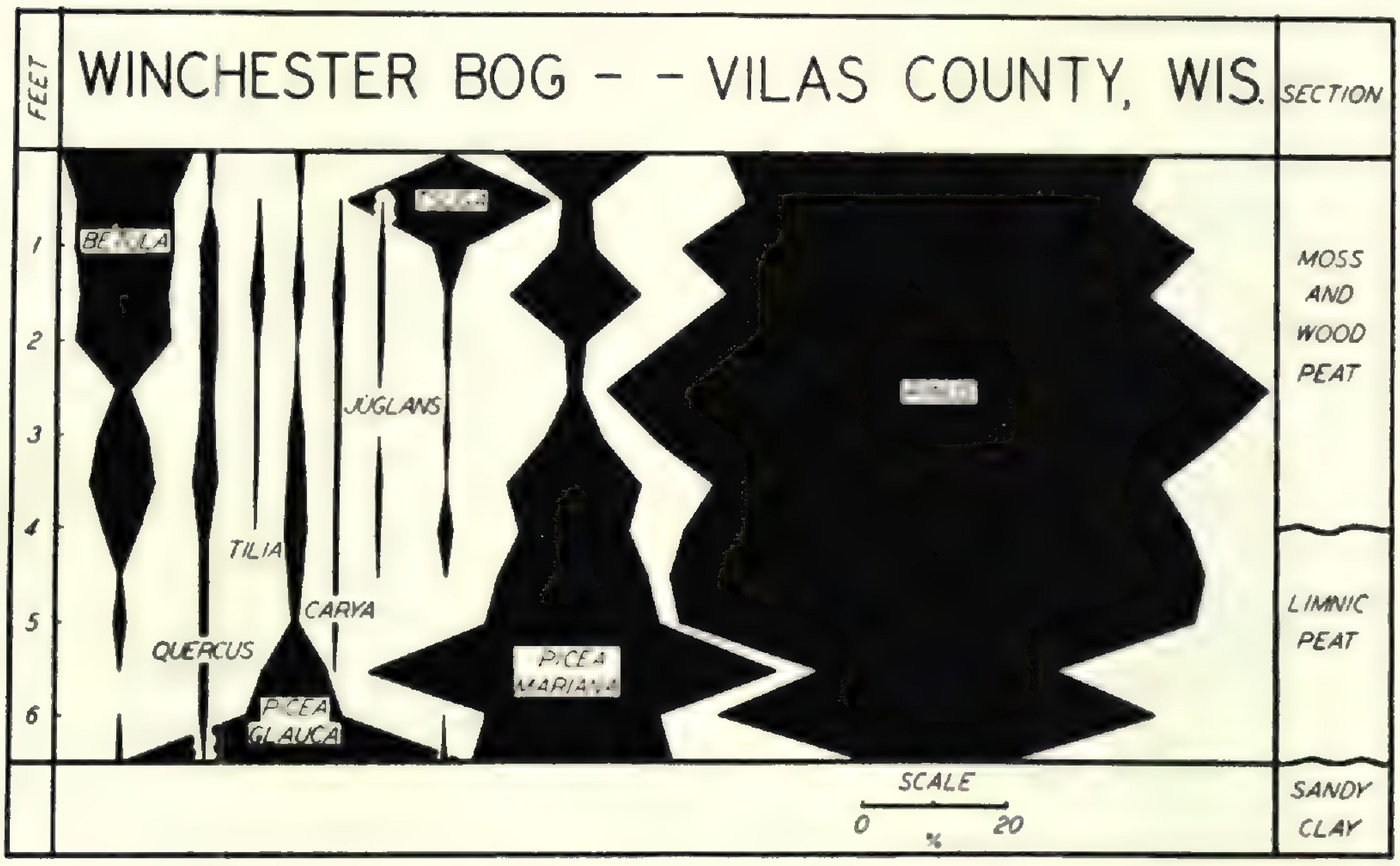

Fig. 1. Pollen-diagram showing microfossil succession and relative abundance of significant tree-species in the Winchester Bog.

actual instead of the relative abundance of the fossil pollen of these and other species.

As noted above, fossil pollen of *Juglans* and *Carya* was found to be fairly abundant, though pollen of either species appears as only .5 to 1.5 per cent of the total count. In regions of pine and spruce, hardwood pollen in the peat on the bog surface is greatly overshadowed by conifer pollen even though hardwoods are abundant in the vicinity. This would indicate that a small percentage of hardwood pollen in a spectrum dominated by conifers is very significant and denotes greater abundance of hardwood trees than would appear on first consideration. This is borne out by the fact that in Table 1 where is shown the rela-

tive abundance of tree pollen based on a count of two hundred fossils, only *Betula* and *Quercus* appear at the surface, whereas *Acer*, *Tilia*, and *Fraxinus* are also known to be living in the vicinity. When the surface sample was studied more fully, these species of fossil pollen were found to be present, and would have been recorded if more than the customary two hundred fossils had been counted. It would seem that for the purpose of securing a qualitative analysis of the ancient forests more than one hundred and fifty to two hundred fossils should be counted. The counting of the above number has been considered adequate by most paleoecologists for determining successional trends of the early forests. For a more thorough understanding of the composition of the forest as indicated at any one level in the peat bog, it might be better to count enough fossils to establish the presence or absence of particular species in the sample. Just what this number should be, the authors are

TABLE 1. PERCENTAGES OF FOSSIL POLLEN IN THE WINCHESTER BOG, VILAS COUNTY, WISCONSIN

Species	Depth in Feet													
	6.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0	.5	0
Abies balsamea	4.5				1.0	3.0	2.0	.5	1.0	1.5	1.5		2.0	1.0
Picea glauca	47.0	13.0	9.0	1.0	2.0	3.0	2.5	2.0	.5		1.5	.5		1.0
Picea mariana	27.5	24.0	56.0	24.0	21.0	15.0	18.5	8.0	2.0	3.0	18.0	5.5	4.0	20.0
Pinus Banksiana	7.5	29.0	4.0	7.0	8.0	4.0	8.0	12.0	4.0	6.0	5.5	2.0	8.0	3.0
Pinus resinosa & *Pinus Strobus*	11.5	31.0	28.0	64.0	65.5	65.5	53.5	66.0	87.0	69.0	52.5	68.5	45.0	56.0
Betula	.5			1.5		5.0	9.0	7.0	2.0	13.0	12.0	13.5	13.0	18.0
Tsuga canadensis	.5					2.0		.5		.5	.5	4.5	28.0	
Quercus		1.0	1.0	1.0	1.0	1.0	2.5	2.0	1.5	2.0	2.0	2.5		1.0
Ulmus americana	.5	2.0	1.0	1.0	1.0	.5	1.0	.5	.5	1.0	.5	.5		
Acer	.5		1.0				1.5	.5	.5	2.0	1.5	.5		
Juglans cinerea						.5	.5			.5	.5	.5		
Carya cordiformis				.5	.5	.5	.5	.5	.5	.5	1.5	.5		
Fraxinus										.5	.5	.5		
Tilia americana							.5	.5	.5	.5	2.0	.5		

not able to state. This might vary with the pollen frequency, the abundance of conifer pollen, and the type of peat.

An examination of the table and diagram indicate a postglacial forest history of the following order: (1) white and black spruce dominant with some pine and balsam fir; (2) pines dominant with a mixture of oak, hickory, butternut, birch, ash, maple, elm, basswood, fir, and hemlock; (3) pines dominant with birch, hemlock, spruces, fir, and oak. Except for the presence of butternut and hickory, this is the usual list of species in the forest history in northcentral Wisconsin. It is interesting to note an observation of Prof. L. S. Cheney (Fassett, l. c.) concerning the associated trees of the bitternut hickory in the northern part of Wisconsin. He states, "The bitternut selects as its home low, wet woods near the borders of streams and swamps, or high rolling uplands. It is commonly associated in our territory with hickory, the hackberry, the oaks, and in the northern part of the state with the yellow birch, basswood, and hard maples."

In the numerous other peat deposits of the same county examined by the writers and Mr. R. M. Kosanke, the existence of oak and other hardwoods is noted in levels comparable to those containing butternut and hickory. Though butternut or hickory pollen has not yet been found in these deposits, a forest somewhat similar to that containing these trees is suggested. Further examination of peat deposits south of Winchester should substantiate the discovery of butternut and hickory pollen in northern Wisconsin and give considerable information on the migration of these species. Care must be taken to make such studies in areas where exist suitable soils for butternut and hickory growth.

The discovery of butternut and hickory fossil pollen in a region considerably beyond the present living ranges of these species may have bearing on the question of earlier forest distribution. In southern and western Wisconsin there are isolated prairies that appear as relicts of more extensive areas. These are part of the prairie peninsula described by Transeau (1935) as extending eastward from Iowa and Illinois into Ohio. If the prairies of Wisconsin were in late postglacial time more extensive, it is probable that the oak-hickory forests of Wisconsin extended farther to the northward. Fuller (1927) states, "Certain studies of existing forests, notably those of Lee ('24) in Minnesota, also

seem to indicate that the spruce-fir climax is slowly invading the deciduous. It therefore seems safe to venture the opinion that the transition belt of the conifer-deciduous forest was perhaps some one hundred miles farther north towards the middle of postglacial time than at the present." The discovery of hickory in the Winchester peat approximately ninety miles north of its present-day range appears to be in agreement with this opinion. The southward movement of the forests and constriction of the prairie areas has been considered as supporting evidence for the Von Post hypothesis (1930) which postulates a period of decreased climatic warmth at present.

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THE PHYLLOTAXY OF CATALPA

Frederick O. Grover

Most descriptions of *Catalpa* and most keys to the genus emphasize the opposite arrangement of the leaves, while they do not mention the whorled arrangement at all, or it is given as a secondary condition. However, according to my observations covering many years, the leaves arise almost always in whorls of three, are only rarely opposite and are occasionally in whorls of four or alternate.

Statements in 43 American, Canadian and German Manuals and Floras now in common use have been consulted by me. Of these seven say unequivocally "leaves opposite"; twenty-six concede a certain amount of verticillateness, the degree varying from "mainly opposite" of Gray's Manual, 7th Edition, and "with opposite or rarely verticillate leaves" of Britton and Brown's Illustrated Flora, to Sargent's "leaves opposite or in verticels of three", and Blakeslee and Jarvis's statement "Leaf scars opposite or more frequently 3 at a node".

Two authors, viz. Small in his Manual and in his Flora of Southeastern United States, and Schumann in Engler and Prantl's Natürliche Pflanzenfamilien, include an alternate arrangement, saying "Leaves opposite, whorled or alternate."

Only eight place the emphasis on the whorled condition. Three of these say "whorled or opposite" and three others "usually whorled" or "usually in whorls of three", while one says flatly "Leaves three at a joint". Dr. William Trelease, alone, makes the precise statement "Leaf scars in whorls alternately of two large scars and one small scar, and one large scar and two small scars".

Because of these widely divergent statements in present day texts, and in support of my own observations I am submitting the following notes from my old files. The observations were made by three of my assistants on more than 2000 young trees of *Catalpa speciosa.*

During the summer of 1906 Mr. T. H. Harvey recorded for me the phyllotaxy of 1000 young trees in the nursery of Mr. F. G. McClelland at Fredericktown, Ohio. He found that 985 of these, i. e. 98.5 per cent, had leaves in whorls of three, 8 had leaves opposite and decussate, while in 7 the leaves were in whorls of four. In none of the trees were the leaves alternate.

In the summer of 1915 Miss Margaret Osborn and Miss Ruth Fullmer recorded the phyllotaxy of 1040 young trees of *C. speciosa* in a planting, several acres in extent, near the old Lake Biological Laboratory at Cedar Point, Ohio. The area is a mature sandbar of dune and pan topography with much xerophytic vegetation, the conditions being far from uniform and quite unlike those under which the nursery trees were growing, Whether due to the varying and generally unfavorable conditions

or to genetic peculiarities or to both causes, the trees in this planting showed a rather large proportion of irregularities in their phyllotaxy. Here 820 trees, i. e. only 78.8 per cent, were reported with leaves in regular whorls of three, 3 with whorls of four, 60 with leaves opposite, and 68 with mixed opposite and whorled phyllotaxy. 78 showed an unequal elongation of different sectors of the stem, resulting in correspondingly irregular phyllotaxies. Of these 11 were reported as having an alternate phyllotaxy; 63 had a mixed phyllotaxy with leaves alternate and whorled, 9 with leaves alternate and opposite, and 6 with leaves alternate, opposite and whorled.

These irregularities are similar to the irregularities in arrangement that are of common occurrence in the transition region from the foliage to the floral portion of many phanerogamous shoots. In *Catalpa*, opposite and alternate arrangements are frequent in the transition region, associated with a reduction in size of the shoot axis and of the leaves. It seeems probable that many records of the phyllotaxy of *Catalpa* may have been taken from flowering shoots, and so from this transition region, rather than from the normal foliage shoot. None of the 2040 trees here recorded had attained flowering age. 88.5 per cent of them had their leaves in whorls of three.

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THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(*Continued from page 405*)

*Crotalaria sagittalis L., var. oblonga Michx. Fl. Bor.-Am. ii. 53 (1803). Northampton County: dry pine woods south of Kendall Grove, no. 5330; dry sandy pine woods, Eastville, no. 5322. Greensville County: sandy roadsides and borders of cultivated fields northeast of Gaskins, no. 13,354. See p. 360.

Typical *Crotalaria sagittalis* has the bracteal leaves (those subtending the inflorescences) narrowly oblong to lanceolate or linear. Such a plant is wide-ranging, from tropical America to the Northern States and southernmost Canada. Var. *oblonga*

has all the leaves, both the true foliage and the bracteal leaves, broadly elliptic-oblong, the upper barely if at all reduced or narrowed. Just such a plant can be readily picked out from among the superabundant typical *C. sagittalis* from Mexico and Florida. From north of Florida there are no specimens in the Gray Herbarium except ours from eastern Virginia, though it is presumably in the Carolinas and Georgia. Michaux, l. c. treated *C. sagittalis* as an inclusive species with three coordinate varieties:

Var. *α. linearis:* foliis linearibus, caule erecto.
— *β. oblonga:* foliis ovali-oblongis; caule erecto.
— *γ. ovalis:* foliis subelliptico-ovalibus, caule procumbente.
HAB. in Virginia et Carolina.

C. sagittalis α. linearis is the narrowest-leaved phase of the common plant. Var. *ovalis* is, as shown by a photograph of the type, *C. angulata* Mill. (*C. rotundifolia* Poiret, *C. ovalis* (Michx.) Pursh); while the same photograph shows var. *oblonga* to the plant here so interpreted. Although Michaux gave the undifferentiated "in Virginia et Carolina" for all three varieties, the sheet preserved in his herbarium gives no locality. True *C. sagittalis* (var. *linearis*) is common in eastern Virginia and *C. angulata* (*C. sagittalis*, var. *ovalis*) frequent in the southeastern counties. Var. *oblonga* is there evidently very rare; I am assuming that it is new to the recorded flora of the state.

C. SPECTABILIS Roth. To the few recorded stations add one in HENRICO COUNTY: waste places and railroad ballast, Richmond, no. 12,374.

AESCHYNOMENE VIRGINICA (L.) BSP. Local range extended to ESSEX COUNTY: sandy and muddy tidal shore of Rappahannock River, northeast of Loretto, no. 13,957; brackish marsh along Piscataway Creek, northwest of Dunnsville, no. 13,358.

DESMODIUM OCHROLEUCUM M. A. Curtis. To the single definite Virginian station, in Sussex County, add one in SURRY COUNTY: rich calcareous wooded ravine near James River, northwest of Chippokes, no. 13,359. See p. 362, where it is shown that the record from Caroline County was based on a misidentification.

*D. CANESCENS (L.) DC., forma **albinum,** f. nov., petalis albidis.—Surry County, VIRGINIA: rich calcareous wooded ravine along James River, Claremont, September 7, 1941, *Fernald & Long*, no. 13,627 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

*Phaseolus polystachios (L.) BSP., var. **aquilonius,** var. nov., foliis submembranaceis supra laevibus, subtus subvelutinis; rhacheos pilis plus minusve incurvatis; calycibus vix venosis; seminibus valde biconvexis atrorubentibus 5–8 mm. longis 4–6 mm. latis.—Connecticut to the upland of North Carolina. The following are characteristic. Connecticut: Franklin, September 29, 1906, *R. W. Woodward* (type, 2 sheets, in Herb. Gray.); New Haven, *Dana;* base of East Rock, New Haven, August 26 and September 27, 1904, *Woodward;* rocky bank near shore of Housatonic River, Huntington, August 18, 1903, *Harger*, no. 4148; rocky woods near seashore, Norwalk, August 23 and September 16, 1901, *Bissell.* New Jersey: by Delaware River road above Milford, Hunterdon County, August 29, 1906, *Van Pelt & Long;* loamy, wooded slope along streamlet tributary to South Branch, Timber Creek, Blackwood, Gloucester County, July 31, 1917, *Long*, no. 17,034. Pennsylvania: Easton, August 29, 1868, *Porter;* steep slope along Hay Creek, ½ mile northeast of Trap Rock Station, Berks County, August 19, 1938, *Hans Wilkens*, no. 5648; wooded roadside, north of Hanover, York County, August 25, 1938, *Louise F. A. Tanger;* rocky hill-slope, quartzite ridge, 1 mile east of Black Horse, Chester County, August 5, 1933, *Fogg*, no. 5796; mountains about Cold Spring, August 7, 1889, *Small.* Delaware: Brandywine, June and July, 1887, *Edw. Tatnall;* Centreville, August 24, 1874, *Commons.* District of Columbia; near Washington, September 25, 1897 and July 30, 1899, *Steele.* Virginia: wooded hill near Dead Run, August 14, 1921, *Leonard & Killip*, no. 897; northwest of Belt's, 1 mile north of Hopewell Gap, Fauquier County, August 9, 1936, *Allard*, no. 2079; Bedford County, August and September, 1871, *A. H. Curtiss.* North Carolina: rich woods, Great Smoky Mts., Swain County, August 1, 1891, *Beardslee & Kofoid.* See p. 367.

Whenever we have collected *Phaseolus polystachios* in southeastern Virginia Mr. Long has regularly protested that it is quite unlike the plant he knows in the Delaware Valley and elsewhere farther north. During September and October of 1941 we twice collected the southern plant under conditions where it was necessary to carry the specimens for a quarter of an hour to a full hour or more before they could be cared for. In both cases the subcoriaceous leaves remained stiff and unwilted. The northern var. *aquilonius*, carried in the open for five minutes, would become a hopelessly wilted wreck. Furthermore, the leaflets of the southern plant, when fresh, adhere very tightly to the fingers or clothes by their minutely scabridulous surfaces and

the lower leaf-surfaces are softly pubescent, almost velvety to the touch. Fortunately we secured ripe fruit—fortunately, for comparison of the southern and the northern plants brings out important seed-characters. These in conjunction with the other points give the following contrasts.

P. POLYSTACHIOS (L.) BSP., based on *Dolichos polystachios* L. Sp. Pl. 726 (1753) (type coll. by Clayton in eastern Virginia, photograph in Gray Herb.). *P. perennis* Walt., Fl. Carol. 182 (1788). *P. paniculatus* Michx. Fl. Bor.-Am. ii. 60 (1803). Leaves firm, not quickly wilting, minutely scabridulous above, softly subvelutinous beneath, when fresh strongly adherent, the larger leaflets 4–8 (–10) cm. long; rachis usually short-hispid, with straightish divergent hairs; calyx (dry) relatively thin, the veins and veinlets evident; seeds flattened on both sides, black or black and gray, 5–10 mm. long, 5–6.5 mm. broad.—Florida to Arkansas, north to eastern Virginia, West Virginia, Tennessee and southern Illinois.

Var. AQUILONIUS. Leaves submembranaceous, promptly wilting, smooth and glabrous or glabrescent above, less pilose beneath, only slightly adherent, the larger leaflets up to 1.3 dm. long; rachis usually with inflexed pilosity; calyx (dry) of thicker texture, its veins obscure or not visible; seeds strongly biconvex, reddish-black (the red usually obvious under a hand-lens), 5–8 mm. long, 4–6 mm. broad.—Southern Connecticut to Delaware and on the upland to North Carolina.

Without better material it is not now possible for me to state more fully the two ranges; either of the varieties may have a broader range. The identity of *Dolichos polystachios* L., basis of *Phaseolus polystachios*, is inferred from its resting wholly on a specimen of Clayton's, a photograph of which is before me. *P. perennis* of Walter can hardly be anything but the southeastern plant; and a full sheet, including ripe seed, of the type of *P. paniculatus* Michx., given, at least a century ago, to Asa Gray is wholly characteristic and with very flat and black seeds. In fact, all the material I have seen from southern Illinois is of typical *P. polystachios*. It is noteworthy, therefore, that, in describing his species from southern Illinois, Michaux explicitly said of it: "Planta more HEDYSARI [i. e. DESMODII] tenacissima . . . semina compresso-reniformia, nigerrima".

We have typical *P. polystachios* from the following stations in Virginia. EXACT LOCALITY UNKNOWN: *John Clayton*, photograph in Gray Herb. NEW KENT COUNTY: thicket bordering

Chickahominy River, Lanexa, no. 13,963. PRINCE GEORGE COUNTY: dry wooded slopes of gullies near Powell's Creek, Garyville, no. 8325. DINWIDDIE COUNTY: dry clearings and borders of woods south of Burgess Station, no. 9080. GREENSVILLE COUNTY: dry sandy pine and oak woods north of Orion, no. 13,660. SOUTHAMPTON COUNTY: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, no. 8736.

*STROPHOSTYLES UMBELLATA (Muhl.) Britton, var. **paludigena,** var. nov. Planta glabra vel glabrescens, leguminibus plerumque 5–7 cm. longis, seminibus quadrato-oblongis furfuraceo-tomentosis 5–10 mm. longis, 3.5–5 mm. latis.—Fresh to brackish tidal marshes, District of Columbia and Virginia. DISTRICT OF COLUMBIA OR MARYLAND: river-marsh, East Branch of Potomac (now Anacostia River), September 5, 1902, *E. S. Steele* (distrib. under unpublished name). VIRGINIA: fresh tidal marsh by Chickahominy River, at "Shady Rest", southeast of Windsor Shades (Boulevard Postoffice) New Kent County, August 31, 1940, *Fernald & Long*, no. 12,689; fresh tidal marsh by Lacey Creek, west of Walker, New Kent County, September 9, 1941, *Fernald & Long*, no. 13,663 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); fresh tidal shore of Chickahominy River, Graves Landing, north of Holdcroft, Charles City County, September 10, 1941, *Fernald & Long*, no. 13,664; field about 5 miles west of Toano, James City County, August 13, 1939, *R. W. Menzel*, no. 306; fresh to brackish tidal marsh by Burwell's Bay, James River, at Bailey's Beach (MacKimmie's Wharf), near Rushmere (Fergusson's Wharf), October 10, 1941, *Fernald & Long*, no. 13,964. See p. 368.

Ordinarily *Strophostyles umbellata* occurs in dry sandy or argillaceous soil or pinelands, but sometimes in dune-hollows or damp habitats. It is not usually in deeply drowned estuaries, habitat of var. *paludigena*. In typical *S. umbellata* the young branches and stems are retrorse-pilose, usually rather densely so, the leaves glabrous or somewhat strigose-pubescent beneath, the legumes 3.7–5.5 cm. long, the seeds quadrate-short-oblong to subcubical, 3–4.5 (rarely to 6) mm. long and 2–3 mm. thick. The estuarine var. *paludigena* is nearly or quite glabrous, its legumes 5–7 cm. long, the heavily scurfy seeds quadrate-oblong and 5–10 mm. long by 3.5–5 mm. broad or thick. Some specimens from marsh habitats are quite transitional: for instance, material from edge of marsh, Chopa Wausic Creek, Virginia, *Tidestrom*, no. 7611, with less pubescence than in typical *S. umbellata* but more than in var. *paludigena*.

*Strophostyles helvola (L.) Ell., var. missouriensis (S. Wats.) Britt. Charles City County: sandy tidal margin of Chickahominy River, Ferry Point, no. 11,064. Isle of Wight County: thicket at base of seeping and calcareous bluffs along Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,688 and 13,965. See p. 372.

Typical *Strophostyles helvola* is low and erect, 1.5–4 dm. high, or soon reclining and trailing (sometimes climbing) to a length of 1 or 2 m.; the principal leaves are often 3-lobed and fiddle-shaped, or, when unlobed, ovate and tapering by straight sides to a short acumination, the terminal leaflet 2–6.5 cm. long and 0.8–4 cm. broad. Var. *missouriensis* is high-climbing, ascending 3–10 m. Its principal leaflets are unlobed, broadly rounded to rhombic-ovate and gradually rounded to blunt or merely subacute apices, the terminal one 4–8 cm. long and 3–6.5 cm. broad. Its flowers are slightly larger (1–1.5 cm. long) than in typical *S. helvola* (0.8–1.3 cm.), its legumes often longer (5–10 cm.) as against 3.5–8.5 cm.; its seeds averaging longer (8–12 mm. long, with hilum 5–7 mm. long) as opposed to 6–9.5 mm. long, with hilum 4–5 mm. long. Var. *missouriensis* is a plant of calcareous shores and river-thickets, occurring from northern Florida to Arkansas, north to Pennsylvania (bank of Schuylkill River at Tunnell Hill, Phoenixville, Chester Co., September 1, 1929, *H. E. Stone*), the Potomac, southern Illinois, Missouri and Kansas. I have seen no material from between northern Florida and the James River.

*Pueraria Thunbergiana (Sieb. & Zucc.) Benth. Nansemond County: very extensively naturalized at border of rich sandy oak and hickory woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, nos. 13,372, 13,661 and 13,966. See p. 352.

Rhynchosia in eastern Virginia.—Two species of *Rhynchosia* abound in the drier soils of southeastern Virginia: one, a trailing or twining plant with stems and branches with spreading or reflexed pilosity, the earliest leaves simple and reniform, the later with 3 rounded to ovate, rhombic or elliptic leaflets only sparsely pilose to glabrescent, the plant passing (erroneously) in our manuals as *R. tomentosa* (L.) Hook. & Arn.; and a second species, erect, with tomentose or tomentulose pubescence, that on the stem appressed-ascending, the 3 oblong to oval leaflets

canescent-tomentose beneath, the plant known as *R. erecta* (Walt.) DC. Besides these, a third species, *R. simplicifolia* (Walt.) Wood, is regularly included in our manuals as extending north to Virginia.

Repeatedly rebelling at the use of the name *Rhynchosia tomentosa* for the Virginia plant which is *not* tomentose and confident that Linnaeus would not so misuse the term, I have looked up the treatments of the species from its original publication by Linnaeus in Sp. Pl. ii. 754 (1753). He there defined a plant in his own herbarium and cited as associated by him with it two which had been earlier defined. His treatment was as follows:

> *tomentosa*. 4. GLYCINE foliis ternatis tomentosis, racemis axillaribus brevissimis, leguminibus dispermis.
> Ononis caule volubili. *Gron. virg.* 81.
> Anonis phaseoloides scandens, floribus flavis sessilibus. *Dill. elth.* 30. *t.* 26. *f.* 29.
> *Habitat in* Virginia.

In Species Plantarum, ed. 2, ii. 1024 (1763) Linnaeus added a reference to Gronovius, ed. 2: 106 (1762); in his treatments in Systema Naturae, through ed. 12 (1767), the same diagnosis (abbreviated) was repeated, without the citations from Gronovius and Dillenius. In Gmelin's edition of the Systema, ed. 13, ii. 1106 (1796) the Dillenian figure was again cited; and Gmelin added to the synonymy the South American *Dolichos pubescens* L., thus adding needlessly to the confusion, since *D. pubescens* can hardly be conspecific with either of the Virginian plants. Willdenow, Sp. Pl. iii². 1061 (1803), followed Gmelin and appended to *G. tomentosa*, as var. β., *Dolichos pubescens*.

In North America, Walter, Fl. Carol. 184 (1788) had described *Trifolium simplicifolium*, basis of *Rhynchosia simplicifolia*, and *T. erectum* "caule subrigido erecto . . . tomentoso, foliis ternatis rotundatis rugosis tomentosis, spicis axillaribus", etc., basis of *R. erecta*. Michaux, Fl. Bor.-Am. ii. 63, 64 (1803), took up the whole group as a variable species with 3 coordinate varieties, *Glycine tomentosa* L.:

> Var. α. *erecta:* caule erecto; tomentosior; foliolis saepe oblongo-ovalibus.
> Trifolium *erectum.* Walt.
> — β. *volubilis:* caule volubili; foliis imis simplicibus, caeteris trifoliatis.

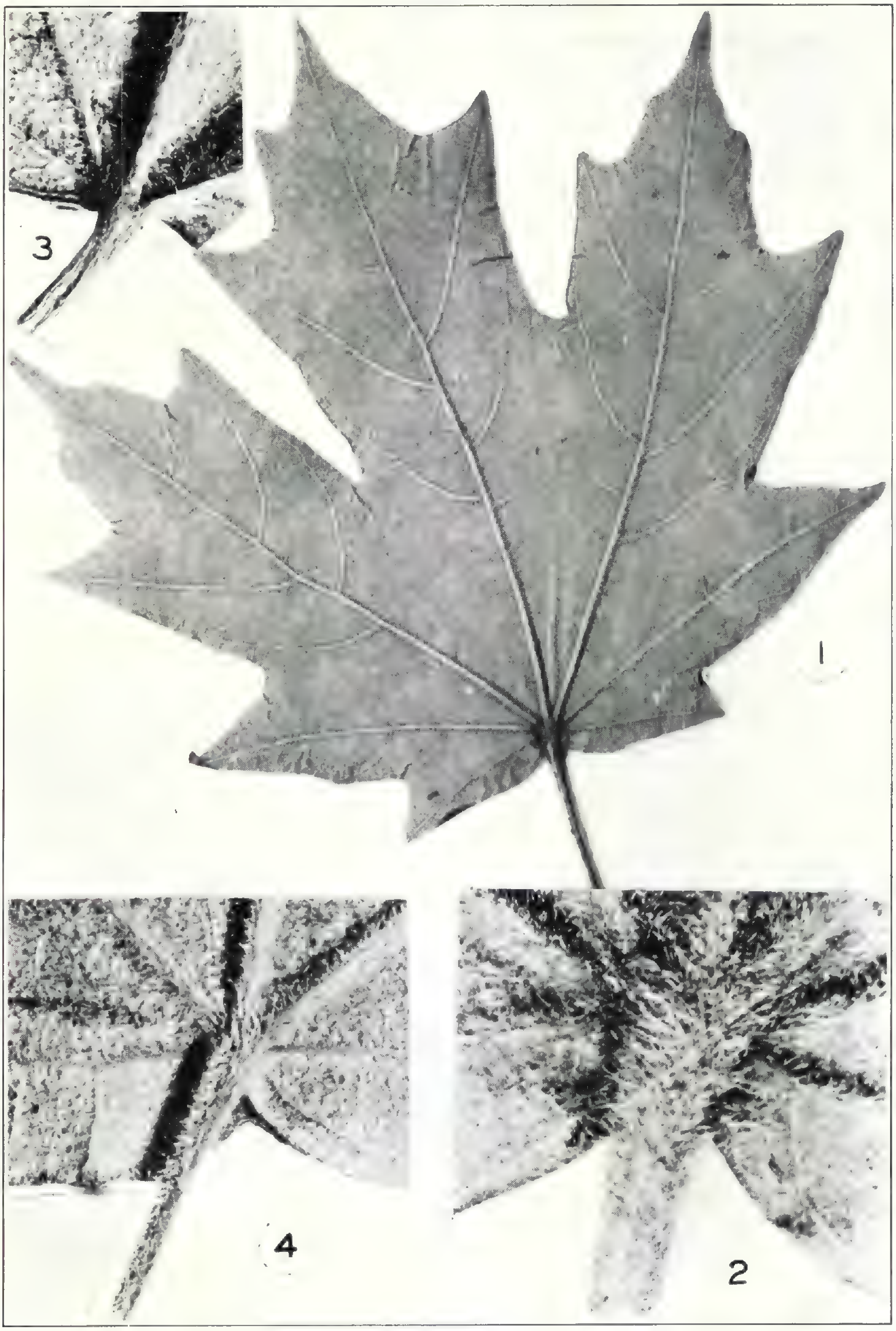

Photo. B. G. Schubert.

ACER FLORIDANUM: FIG. 3, lower surface of leaf and summit of petiole, × 6. Forma VILLIPES: FIG. 4, lower surface of leaf and summit of petiole, × 6. Var. LONGII, forma PLATYLOBUM: FIG. 1, leaf, × 1; FIG. 2, lower surface of leaf and summit of petiole, × 6.

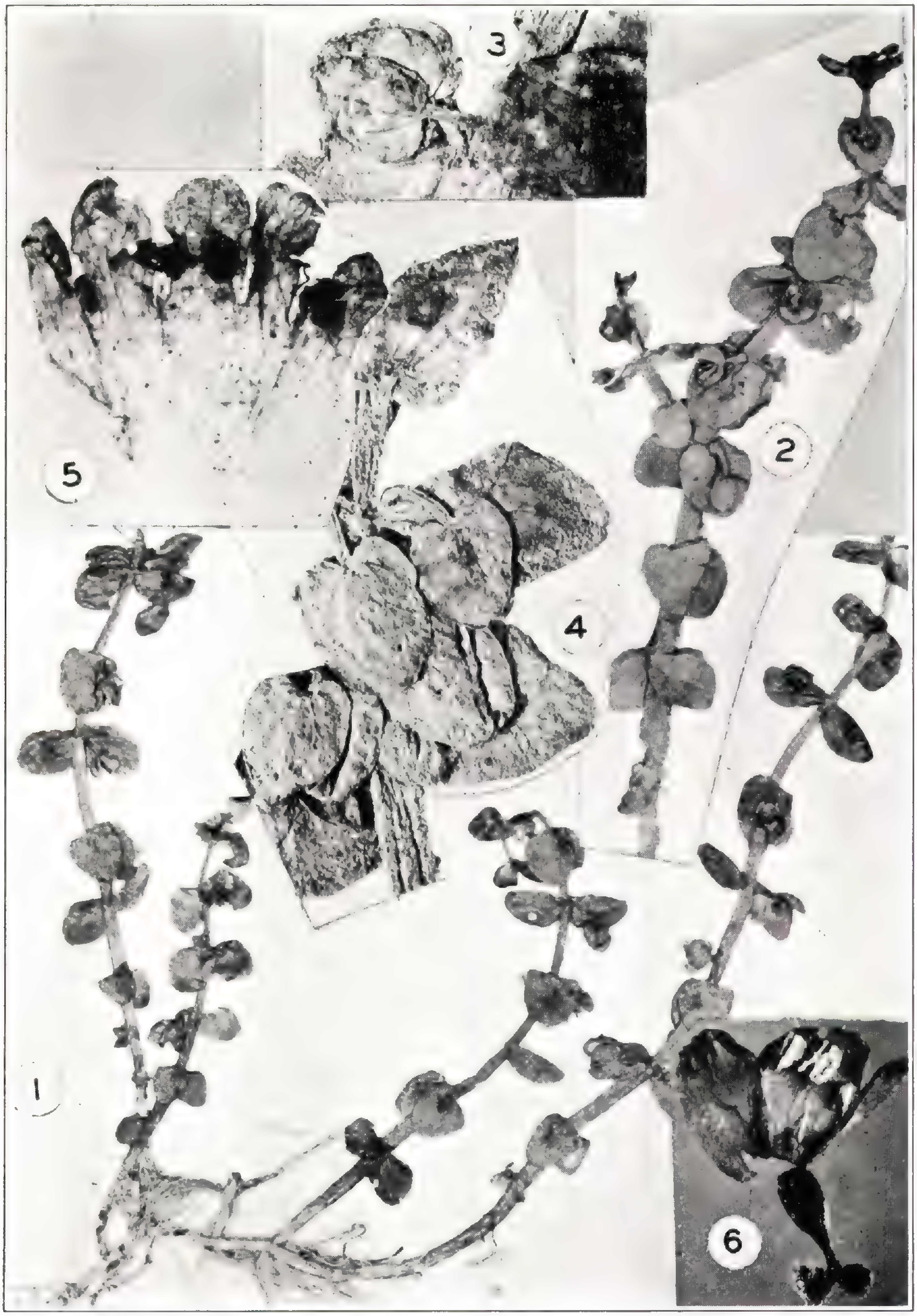

Photo. B. G. Schubert.

Bacopa stragula: figs. 1 and 2, portions of plants, × 1; figs. 3 and 4, flowers, × 3; figs. 5 and 6, corollas, laid open, × 10.

— γ. *monophylla:* caulibus brevissimis; foliis omnibus unifoliatis sive simplicibus, subreniformi-rotundatis.
TRIFOLIUM *simplicifolium.* WALT.
Hab. in Virginia et Carolina.

Here, apparently, was the beginning of the record of *R. simplicifolia* (*R. reniformis* (Pursh) DC.) from Virginia. It should be noted, however, that Michaux was giving the inclusive range for all three plants included, two of which are well known in Virginia.

Pursh very promptly, in his Fl. Am. Sept. ii. 486 (1814), separated the simple-leaved plant as *Glycine reniformis* (with *Trifolium simplicifolium* and *G. tomentosa*, var. *monophylla* cited as synonyms) and restricted its range to Carolina and Georgia. Torrey & Gray, likewise, noting specimens seen, cited for this plant only South Carolina, Florida and Alabama. The northernmost specimens in the Gray Herbarium come from Cumberland and Moore Counties, North Carolina. It can safely be dropped from the Virginia list.

Returning to the two species actually in Virginia, the next important step in their history seems to have been their treatment, along with the species last discussed, as a separate genus *Arcyphyllum* Elliott in Journ. Acad. Nat. Sci. Phila. i. 371 (1818). Elliott's new genus, promptly united with *Rhynchosia* Lour. (1790), contained *Arcyphyllum simplicifolium* (Walt.) Ell., *A. erectum* (Walt.) Ell. and the newly proposed species,

2. *Difforme.*
A. caule volubili, foliis subrhomboideis, rugosis, interioribus simplicibus, superioribus ternatis, racemis axillaribus summitate confertifloris.
Glycine tomentosa, var. b. *volubilis,* Mich. 2, p. 62.
Hab. in aridis et cultis.

Elliott, writing from Charleston, South Carolina, obviously secured his *Arcyphyllum difforme* in that region. He very promptly abandoned it, however, for in his Sketch, ii. 234 (1822) he modestly refrained from mentioning it, even in synonymy, returning to the Linnean *Glycine.* Elliott's diagnosis in 1822 of *Glycine tomentosa,* beginning "G. caule volubili; foliis ternatis, rhombeis, rugosis", was so like his diagnosis of *Arcyphyllum difforme* that there can be no question regarding the identity of the latter.

DeCandolle promptly took up Elliott's new specific name, although failing to cite Elliott as its original author. In DC. Prodr. ii. 284 (1825), where *Arcyphyllum* appears in the generic synonymy of *Rhynchosia*, we find the following:

> 3. R. difformis, caule volubili velutino, stipulis oblongo-lanceolatis, foliis infer. simplicibus summis trifoliolatis, racemis longè pedunculatis confertè subspicatis, cal. laciniis lanceolatis acuminatis . . . in aridis et cultis Carolinae. Glycine tomentosa var. volubilis Michx. fl. bor. am. 2. p. 63.

Although DeCandolle failed to cite the synonym, *Arcyphyllum difforme* Ell., the diagnosis, with "foliis infer. simplicibus summis trifoliolatis" and the habitat, "in aridis et cultis Carolinae" are so clearly derived from Elliott that the combination should certainly be written *Rhynchosia difformis* (Ell.) DC.

Torrey & Gray (1838) maintained *Rhynchosia tomentosa* in the all-inclusive sense, with vars. *monophylla, volubilis, erecta* and two more, all now regularly considered distinct species; and Gray, admitting the polymorphous group to the Manual in ed. 2, so treated it through ed. 5. So long as the several plants (whether erect and tomentose, with trifoliolate leaves; erect and with simple suborbicular leaves; or twining or trailing, with early leaves simple, the later trifoliolate and not tomentose) were all treated as *R. tomentosa,* the identity of the Linnean type was relatively unimportant. Now that the three (and other) elements are treated as species the identity of the plant which Linnaeus had immediately before him in preparing Species Plantarum (1753) becomes highly important. Dr. B. Daydon Jackson, in his Index to the Linnean Herbarium (1912), states that in preparing ed. 1 Linnaeus had a plant of his *Glycine tomentosa* in his own herbarium. This was studied more than a century ago by Asa Gray who, in his manuscript notes on the Linnean Herbarium, recorded: "*Glycine tomentosa! = Rhynchosia tomentosa* var. *erecta,* fol. oblongis (Specimen est Clayt.)." This erect plant, the actual type, is really tomentose and is properly described by the trivial name used by Linnaeus. The twining or creeping plant, with broader leaflets is *not* tomentose. There is no question that the plate of Dillenius was made from the latter, and a Clayton specimen preserved at the British Museum is the latter (photograph before me). Clayton, obvi-

ously, collected both the common species of southeastern Virginia and Linnaeus included them both under *Glycine tomentosa*. The brief diagnosis of Gronovius, made from Clayton's material, was cited by Linnaeus only in its abbreviated form, as "Ononis caule volubili. *Gron. virg.* 81." When the original Gronovian account is looked up, however, it is found that Gronovius, like Linnaeus, cited the Dillenian plate of *Anonis phaseoloides scandens*, the twining species, but more important, he quoted Clayton's account of the plant: "Trifolium nunc volubile, nunc erectum", etc. In other words, the full account in Gronovius calls for stems either twining or erect. Clayton, Gronovius and Linnaeus, like Michaux, Torrey & Gray and others still later, saw only one species, although they had two.

In view of this evidence I am taking up for the erect plant with tomentose leaves and stems, which is now passing as *Rhynchosia erecta* (Walt.) DC., the appropriate name R. TOMENTOSA (L.) Hook. & Arn. The twining or trailing species with broader short-pilose to glabrescent leaflets, the plant erroneously passing as *R. tomentosa*, is R. DIFFORMIS (Ell.) DC.

*OXALIS EUROPAEA Jordan, forma **pallidiflora,** f. nov., petalis pallide colore limonis.—Isle of Wight County, VIRGINIA: seeping calcareous wooded bluffs by James River, west of old Fort Boykin, June 14 and 16, 1941, *Fernald & Long*, no. 13,060 (TYPE in Herb. Gray., ISOTYPE in Herb. Phil. Acad.).—A pale-flowered form of otherwise typical *O. europaea*. See p. 345.

*O. EUROPAEA Jordan, var. BUSHII (Small) Wiegand, forma SUBGLABRA Wiegand. NANSEMOND COUNTY: border of low woods, Adams Swamp, south of Baines Hill School, no. 13,061; gigantic plants, up to 1.125 m. high, the variety and form chiefly in the Mississippi Valley.

PTELEA TRIFOLIATA L. Local range extended to PRINCE GEORGE COUNTY: abundant in thickets and woods back of beach of James River, Windmill Point, Flowerdew Hundred, no. 13,062. See p. 346.

PONCIRUS TRIFOLIATA (L.) Raf. Range extended north to ESSEX COUNTY: border of dry woods northeast of Loretto, shrubs up to 4 m. high, fruit October 15, 1941, no. 13,967, flowers April 15, 1942, no. 14,185. See p. 372.

*RHUS COPALLINA L., forma **frondosa,** f. nov., paniculis valde foliosis.—VIRGINIA: border of fresh to brackish tidal marsh by Burwell's Bay, James River, at Bailey's Beach, near Rushmere, Isle of Wight County, October 10, 1941, *Fernald & Long*, no. 13,969 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

Cyrilla racemiflora L. Range extended northward into Dinwiddie County: border of depression in argillaceous woods, west of Winfield's Mill, no. 13,970. See p. 374.

Celastrus scandens L. Local range extended to Caroline County: steep wooded bluff by Rappahannock River, northwest of Return, no. 13,973.

Acer floridanum (Chapm.) Pax. To the few recorded stations in the state add the following from James City County: rich woods and slopes by James River, Grove Landing, southeast of Grove, nos. 13,382, 13,386, 13,389, 14,186, 14,187, *Delisle*, nos. 1–6. See plate 725, figs. 1 and 2, and 727, fig. 3. See pp. 359 and 360.

*A. floridanum (Chapm.) Pax, forma **villipes** (Rehder), stat. nov. Var. *villipes* Rehder, Trees and Shrubs, ii. 255 (1913). Quite like typical *A. floridanum* except in having densely pilose petioles and, often, young shoots. Of similar range and sometimes growing with typical *A. floridanum* (with glabrous branchlets and petioles). The following Virginian specimens belong here. James City County: rich woods and slopes by James River, Grove Landing, southeast of Grove, no. 13,387; *Delisle*, no. 7; woods and thickets back of sand-beach of James River, Martin's Beach, southeast of Grove, no. 13,388. See plate 725, fig. 3 and 727, fig. 4.

*A. floridanum, var. **Longii,** var. nov. (tab. 726). Arbor ad 30 m. alta, cortice albido deinde exfoliato, ramibus griseis ramulis juvenilibus saepe densissime velutino-villosis; foliis maturis subtus petiolisque dense velutino-villosis, petiolis crassis 1.5–2 mm. diametro, laminis subaequaliter longis et latis e basi plus minusve cordatis vel subtruncatis 3-lobatis 7–13 cm. longis 7–14 cm. latis, lobis anguste oblongo-ovatis longe attenuatis integris vel sparse lobulatis mediis 4–8 cm. longis; calycibus 3–4 mm. longis; stylo 2.5–3 mm. longo, stigmatibus 5–6 mm. longis; antheris 1.5–2 mm. longis; samaris 2.5–3.5 cm. longis, loculis horizontalibus 8–10.5 mm. longis 5–7 mm. latis, alis adscendentibus 1.7–2.5 cm. longis 9–11 mm. latis.—James City County, Virginia: rich woods and slopes by James River, Grove Landing, southeast of Grove, July 29 and 30, 1941, *Fernald & Long*, no. 13,385 (branchlets nearly glabrous); April 19, 1942, *Fernald, Long & Abbe*, nos. 14,187 (type in Herb. Gray.; isotype in herb. Phil. Acad.) and 14,189, May 5, 1942, *Delisle*, nos. 8–12.

Var. Longii, forma **platylobum,** f. nov. (tab. 727, fig. 1 et 2), foliis late rotundatis cordatis 1–1.7 dm. latis, lobis late oblongis vel oblongo-obovatis lobis grosse acuteque lobulatis.—Southeastern Virginia: rich woods and slopes by James River, Grove Landing, southeast of Grove, *Fernald & Long*, nos. 13,383 and 13,384 (type in Herb. Gray.; isotype in Herb. Phil. Acad.),

Photo. B. G. Schubert.

Bacopa simulans: fig. 1, plant, × 1; fig. 2, corolla, laid open, × 10.

Photo. B. G. Schubert.

GRATIOLA VIRGINIANA: FIGS. 4 and 5, fruiting nodes, × 1. Forma ACUTIDENS: FIGS. 1 and 2, portions of plant, × 1. Var. AESTUARIORUM: FIG. 3, fruiting tip, × 1.

May 5, 1942, *Delisle*, nos. 13–15; rich calcareous slopes by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), Isle of Wight County, August 27 and 29, 1940, no. 12,718, April 17, 1942, *Fernald, Long & Abbe*, no. 14,190. Grimes, no. 3929, from calcareous bluffs along James River near Camp Wallace, is transitional between the typical var. *Longii* and forma *platylobum*, but the wings of the samaras are small for either.

When more fully understood *Acer floridanum* and var. *Longii* may prove to be specifically separable. In their extreme forms they are far apart but essentially all characters too closely converge for me to feel certain that they are more separable as species than the northern and upland *A. saccharum* and its var. *nigrum*. These in extreme development appear abundantly distinct; when carefully scrutinized, however, there are too many intergradient forms. As I now understand the variations of *A. floridanum* I should separate them as follows.

Tree with close whitish bark becoming furrowed in age, the trunks up to 7 dm. in diameter; branchlets grayish, with purplish tinge, the young branchlets of the season 1–2 mm. thick; mature leaves minutely pilose to glabrate beneath, those of fertile shoots (not the vigorous leaders) 3–9.5 (av. 6.7) cm. long, 3.5–11 (av. 8) cm. broad, the middle lobe 2–5.5 (av. 3.3) cm. long; petioles 0.5–1 mm. thick (near middle); flowering calyx (including hypanthium) 1.5–2.5 mm. long; style 1–2.5 mm. long, stigmas 1.5–5 mm. long; anthers 1–1.5 mm. long; samaras 1.5–3 cm. long, the mature locules 5–10 (av. 6.5) mm. long and 4–6.5 (av. 5.4) mm. thick, the mature wings 1–2.2 (av. 1.6) cm. long and 4.5–9 (av. 7) mm. broad.

Petioles and young branchlets glabrous........*A. floridanum* (typical).

Petioles and often the young branchlets densely short-pilose..Forma *villipes*.

Tree with finally exfoliating bark, the trunks up to 1.2 m. in diameter; branchlets gray, the young branchlets of the season 2–3 mm. thick, oftenest densely villous; mature leaves densely velutinous beneath, those of fertile shoots 7.5–13 (av. 10) cm. long and 7–17 (av. 13) cm. broad, the middle lobe 3.5–8 (av. 6.3) cm. long; petioles 1.5–2 mm. thick near middle, heavily velutinous; flowering calyx 3–4 mm. long; style 2.5–3 mm. long, stigmas 5–6 mm. long; anthers 1.5–2 mm. long; samaras 2.5–3.5 cm. long, the mature locules 8–10.5 (av. 9.25) mm. long and 5–7 (av. 6.5) mm. thick, the mature wings 1.7–2.5 (av. 2.1) cm. long and 9–11 (av. 10) mm. broad.

Leaves slightly cordate to subtruncate at base, the 3 lobes narrowly oblong-ovate, long-attenuate, entire or remotely and obtusely lobulate................................Var. *Longii*.

Leaves definitely cordate-rotund, the broad-oblong to oblong-obovate lobes coarsely and acutely lobulate.
Var. *Longii*, forma *platylobum*

The measurements (many hundreds), based on the large representation of *Acer floridanum* in the Britton Herbarium of the New York Botanical Garden and that of the Arnold Arboretum and the lesser representation in the Gray Herbarium include the Virginian material as well as the more southern and more typical specimens (pl. 725, fig. 1, and 727, fig. 3). As a matter of fact, the original Florida specimens and most of the recent material from there, thence to Texas and Arkansas, are smaller in all parts than the Virginian series, in which leaves and fruits approach the dimensions in var. *Longii*. It is this transitional series and occasional large-leaved and large-fruited material from the Carolinas and Georgia which forces me to the conclusion that *A. floridanum* is as plastic as *A. saccharum* and *A. rubrum*.

The Grimes material and some other in herbaria has been confused with *Acer leucoderme* Small. That, however, is a large shrub or very small tree with the leaves green on both sides (not whitened as in *A. floridanum*), and the pubescence of the lower surface minutely hirtellous (of straightish hairs) rather than pilose-tomentulous or velutinous.

In plate 725 figs 1 and 2 are of Acer floridanum: fig. 1, portion of fruiting branch, × 1, from Chattahoochie, Florida, *A. H. Curtiss*, no. 497*; fig. 2, portion of inflorescence, × 3, from Grove Landing, Virginia, *Fernald, Long & Abbe*, no. 14,168. Fig. 3, forma villipes: portion of type, × 1, of var. *villipes* Rehder.

Plate 726 is of Acer floridanum, var. Longii, all figs. from type-tree: fig. 1, flowering branch, × 1; fig. 2, flowers, × 3; fig. 3, fruiting branch, × 1.

In plate 727 figs. 1 and 2 are of Acer floridanum var. Longii, forma platylobum, both from type: fig. 1, leaf, × 1; fig. 2, base of leaf (lower surface) and summit of petiole, × 6. Fig. 3, A. floridanum: base of lower surface of leaf and summit of petiole, × 6, from *Curtiss*, no. 497*. Fig. 4, forma villipes: base of lower surface of leaf and summit of petiole, × 6, from type.

Impatiens biflora Walt., forma Peasei A. H. Moore. This striking color-form, with cream-colored corolla, the petals heavily spotted with old-rose, occurs in Norfolk County: wet woods and thickets along the Feeder Ditch from Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,682.

Vitis Baileyana Munson. Local range extended into Sussex County: bottomland woods along Nottoway River, east of Huske, nos. 13,080 and 13,658. Leaves thinner and more often lobed than in *V. vulpina* (*cordifolia*), soft-pilose like the new branchlets; fruit bluish with a bloom, sweetish, ripe and falling September 5, much earlier than the bloomless, blackish and intensely sour fruit of *V. vulpina*. See pp. 348 and 366.

V. CINEREA Engelm., var. FLORIDANA Munson. Range extended northward into KING AND QUEEN COUNTY: border of woods at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,390.

PARTHENOCISSUS QUINQUEFOLIA (L.) Planch., forma HIRSUTA (Donn) Fern. Although it is generally stated that this form is sterile, flowering plants occur in ISLE OF WIGHT COUNTY: thicket back of sand-beach of James River, west of old Fort Boykin, no. 13,074.

SIDA INFLEXA Fernald. Range extended into GREENSVILLE COUNTY: dry sandy pine and oak woods north of Orion, nos. 13,688 and 13,689; a very fine colony, with handsomely flowering plants up to 1.5 m. or more in height, the leaves (in disturbed soil) up to 2.8 cm. broad. See p. 367.

*ANODA CRISTATA (L.) Schlecht. ISLE OF WIGHT COUNTY: abundant weed in cultivated field near James River, west of old Fort Boykin, no. 13,690.

Tentatively so identified, the plants of tropical and subtropical America (both North and South) passing as *A. cristata* being a heteromorphous series not yet critically studied. The Virginia plant, loosely villous-hirsute, has maple-like leaves, the blue-violet petals being shorter than the calyx. It is not clearly matched but, since it is obviously adventive, it would be quite unwise to give it a new name until the whole genus is adequately and critically studied. See p. 361.

*HYPERICUM PUNCTATUM Lam., forma **subpetiolatum** (Bickn.), stat. nov. *H. subpetiolatum* Bickn. in Small, Fl. Se. U. S. 790 (1903). JAMES CITY COUNTY: border of rich woods by James River, Grove Landing, southeast of Grove, no. 13,394. DINWIDDIE COUNTY: depression in argillaceous woods west of Winfield's Mill, no. 13,977. GREENSVILLE COUNTY: bottomland woods along Meherrin River northeast of Gaskins, no. 13,395. See p. 359.

When it occurs, as in the above cases, in pure colonies forma *subpetiolatum*, with oblanceolate leaves tapering to subpetiolar bases, is strikingly different from extreme *Hypericum punctatum*, with oblong or elliptic sessile round-based or subamplexicaul leaves. Much material is clearly transitional and in many cases found in the herbaria, both extremes have been collected and distributed under one label. With no evidence of a different range, forma *subpetiolatum* is best considered a well defined form.

H. PROLIFICUM L. Local range extended to ESSEX COUNTY: border of dry woods northeast of Loretto, no. 13,975. See p. 372.

H. denticulatum Walt. To the single small station in Greensville County add one in Dinwiddie County: open argillaceous woods just east of McKenney, nos. 13,976 and 14,365. See p. 373.

Cuphea petiolata (L.) Koehne. Isle of Wight County: upper margin of sand-beach of James River, west of old Fort Boykin, very scarce, no. 13,703; our first station in the Tidewater area. See p. 362.

Ammannia Koehnei Britton, var. exauriculata Fern. Range extended into Nansemond County: border of brackish marsh along Western Branch, south of Reid's Ferry, no. 13,398. See p. 352.

Ludwigia pilosa Walt. To the single known Virginia station, in Norfolk County, add an extensive one in Nansemond County: wooded bottomland, Adams Swamp, south of Baines Hill School, no. 13,705; the plants rooting at tips. See p. 368.

L. alata Ell. To the single known Virginia station add another, also in Princess Anne County: reed-marsh along Blackwater River, southwest of Pungo Ferry, nos. 13,981 and 13,982. See p. 370.

Gaura biennis L. Range extended down the James. Surry County: woods and thickets back of sand-beach, Claremont, no. 13,708. Isle of Wight County: thicket back of sand-beach, west of old Fort Boykin, no. 13,709. See p. 362.

Torilis japonica (Houtt.) DC. Local range extended to Isle of Wight County: waste ground back of sand-beach of Burwell's Bay, James River, below Rushmere, no. 13,096. See p. 344.

Zizia aurea (L.) Koch. Locally abundant in Isle of Wight County: seeping calcareous wooded bluffs by James River, west of Old Fort Boykin, no. 13,093; very large, nearly 8 dm. high. See p. 345.

*Z. aurea, forma obtusifolia (Bissell) Fern. Casual plants with the last, no. 13,094. See p. 345.

Taenidia integerrima (L.) Drude. James City County: locally abundant, rich woods and slopes by James River, Grove Landing, southeast of Grove, no. 13,411; our first station on the Coastal Plain. See p. 359.

*Lyonia ligustrina (L.) DC., var. foliosiflora (Michx.) Fern. Norfolk County: fresh reed-marsh and swale along Northwest River, near Northwest, no. 13,992; compact shrub 1–2 m. high, the first from north of North Carolina. See Rhodora, xliii. 628 (1941). See p. 370.

Vaccinium arboreum Marsh. Range extended northward into Dinwiddie County: low woods near Mt. Olivet Church, no. 13,994.

Hottonia inflata L. To the rather few stations add another

in Sussex County: open muddy soil, Coppahaunk Swamp, south of Spring Hill Church, no. 13,723.

Bumelia lycioides (L.) Gaertn. f., var. virginiana Fernald. Range extended up the James to Prince George County: many trees in thicket and woods back of beach, Windmill Point, Flowerdew Hundred, no. 13,106. Also to James City County: base of rich woods and slopes by James River, Grove Landing, southeast of Grove, no. 13,419. See p. 346.

Styrax americana Lam. Local range extended to Charles City County: wooded bank by Chickahominy River, Cypress Bank Landing, no. 13,391. See p. 357.

*Buddleja Davidi Franch. Surry County: slightly naturalized in woods and thickets back of sand-beach of James River, Claremont, no. 13,728.

*Forsythia viridissima Lindl. Southampton County: waste ground, Franklin, no. 13,726.

Cynoctonum Mitreola (L.) Britton. To the very few recorded stations add an extensive one in Southampton County: wooded bottomland of Blackwater River, southeast of Ivor, no. 13,727. See p. 366.

Sabatia stellaris Pursh, forma albiflora Britton. Extending inland to Essex County: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,422. See p. 354.

*S. campanulata (L.) Torr., var. gracilis (Michx.) Fern. Greensville County: exsiccated argillaceous fallow field near Meherrin River, northeast of Gaskins, no. 13,421. Although in Rhodora, xxxvii. 438, *S. gracilis* was reported from Princess Anne County, the material is transitional to *S. campanulata*. See Rhodora, xxxix. 444 (1937). The Gaskins plant is quite satisfactory var. *gracilis*. See p. 360.

S. dodecandra (L.) BSP. To the few recorded stations add the following. Nansemond County: border of brackish marsh along Western Branch, south of Reid's Ferry, no. 13,423. Norfolk County: sphagnous pocket at border of reed-marsh of Northwest River near Northwest, no. 13,997. See pp. 352 and 370.

Gentiana cherokeensis (W. P. Lemmon) Fernald. To the extensive area in Sussex County add one twenty-two miles farther west, in Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,001. See p. 373.

Vinca major L. Often abundantly naturalized. Seen in several counties. See p. 372.

*Cuscuta indecora Choisy. Princess Anne County: on various herbs, damp woods, Virginia Beach, no. 4149 (distrib. as *C. Coryli* Engelm.).

Identification corrected by Dr. T. G. Yuncker, who notes:

"This is the first specimen of the species I have seen from the northeastern United States". The species ranges from the West Indies and Florida to Texas and Mexico, north rather generally in the Mississippi Basin and westward.

C. Coryli Engelm. Princess Anne County: on *Cassia*, border of pine barrens, near Princess Anne Courthouse, *Fernald & Griscom*, no. 2879 (distrib. as *C. polygonorum* Engelm.).

Identification corrected by Dr. Yuncker. In his *Revision of the North American and West Indian Species of Cuscuta*, Univ. Ill. Biol. Mon. vi. 146—repr. 56 (1921), Yuncker cited Virginian material only from the Peaks of Otter and from farther west.

Hydrolea quadrivalvis Walt. Range extended into Greensville County: sandy and muddy border of Slagle's Millpond, northwest of Emporia, very abundant, no. 13,733.

Heliotropium indicum L. To the few recorded stations add one in Norfolk County: swampy woods west of Bethel Church, Gertie, no. 14,003.

Scutellaria ovata Hill, var. **versicolor** (Nutt.), stat. nov. *S. versicolor* Nutt. Gen. ii. 38 (1818).—A new station along the James. Prince George County: thickets and woods back of beach, Windmill Point, Flowerdew Hundred, no. 13,126. Also in Greensville County: rich wooded slope just above the "fall-line" by Three Creek, northwest of Emporia, no. 14,004.

Although Blake in Rhodora, xvii. 133 (1915) adopted the name *S. ovata* Hill, Hort. Kew. ed. 1: 242 (1768) and ed. 2: 242, pl. 8 (1769) for *S. versicolor* Nutt. and stated that "The types of *S. versicolor* Nutt. and *S. caroliniana* Walt., both in the British Museum, are identical with the plant here taken as *S. ovata* Hill", there seems to me considerable doubt, inasmuch as Blake proceeded (l. c. 134) to make for the plant with "enlarged floral bracts" the combination *S. ovata* var. *bracteata* (Benth.) Blake, based on *S. versicolor*, β. *bracteata* Benth. Labiat. 433 (1832–36). Nuttall definitely described his *S. versicolor* with "bractes short and sessile" and Bentham, who must have known the type, so took it up, his *S. versicolor*, β. *bracteata* "non nisi foliis floralibus majoribus subcoloratis differt". *S. versicolor* was described by Nuttall as "The largest North American species", because it had "leaves broad-cordate, large, . . . nearly smooth; petioles very long . . . leaves thin and diaphanous, a little hirsute above, 2 or 3 inches broad and 3 or 4 long, . . . peduncles [petioles] 1 and a half to 2 inches long". This account is wholly

in accord with the plant taken by Bentham, Gray and others as *S. versicolor*, the broadly cordate-ovate thin blades of the principal leaves in the short-bracted series before me ranging from 2½ to 5 inches long and 2–4 inches broad, with petioles 1–3 inches long. This plant, true *S. versicolor*, ranges from Virginia to Iowa, south to Louisiana. The material of Bentham's *S. versicolor*, var. *bracteata* comes from southern Illinois to Mississippi, Arkansas, Oklahoma and Texas. Its leaves are relatively narrow-ovate, firm, heavily pubescent, and ranging from 1½ to 3 (rarely in transitional specimens to 4) inches long, and from 1 to 2½ inches broad, with petioles ½–2 inches long. Hill's plate of his *S. ovata* shows a more branched inflorescence than I can match in most *S. versicolor* but easily matched in *S. versicolor*, var. *bracteata*, very large bracts, and narrowly ovate leaves on relatively short petioles. To me it is a far better match for var. *bracteata* than for typical *S. versicolor*. Hill described *S. ovata* with stem "subhirsutus" and so illustrated it. In typical *S. versicolor* the pubescence of the stem is a minute inflexed pilosity (Nuttall said "a soft and glandular pubescence"); in var. *bracteata* of divergent glandular hispidity. I am, therefore, treating *S. ovata* as based upon a garden specimen of *S. versicolor*, var. *bracteata*, in spite of the fact that Hill said the flowers were "rubescentes". The native plant has the corolla blue, with the lower lip whitish.

I, of course, do not know just what was taken as Nuttall's type at the British Museum and pronounced "identical" with *S. ovata*. If it is identical it disagrees in many points with Nuttall's detailed description. Bearing in mind that Nuttall did not think in terms of "types" and that he often marked with an asterisk on his labels wholly different things, which he had called the same, his rather vivid account of *S. versicolor*, accurately describing a familiar plant, should have precedence over a specimen which, if it matches Hill's plate and brief description, does not well agree with Nuttall's description.

*S. ovalifolia Pers., var. **hirsuta** (Short), stat. nov. *S. hirsuta* Short in Transylv. Journ. Med. viii. 582 (1836). *S. pilosa* Michx., var. *hirsuta* (Short) Gray, Syn. Fl. N. Am. ii[1]. 379 (1878). Henrico County: rich wooded slopes by James River, west of Varina, no. 13,123. See p. 349.

Although described from Kentucky and noted by Leonard in

Contrib. U. S. Nat. Herb. xxii. 741 (1927) only from that state, it is represented in the Gray Herbarium also from West Virginia, Ohio, Indiana and Michigan, south to Georgia and Mississippi. There is one other Virginian specimen: Wytheville, Wythe County, *Howard Shriver*. The Varina plant is the first from east of the Blue Ridge of Virginia and North Carolina.

*S. punctata (Chapm.) Leonard. James City County: rich land, Matoaka Park (near Williamsburg), June 29, 1939, *R. W. Menzel* (as *S. serrulata* Andr.). The first from north of upland North Carolina.

*Satureja Calamintha (L.) Scheele, var. nepetoides (Jordan) Briquet. Isle of Wight County: by path on rich calcareous wooded slope along James River, west of old Fort Boykin, no. 13,739. Apparently not previously reported from North America. See p. 361.

Physalis angulata L. Range extended into Southampton County: roadside fill above wooded bottomland of Blackwater River at South Quay Bridge, east of Oak Grove School, no. 13,742; very large plants stimulated by loosening of soil, 1.2 m. high, with leaves up to 9 cm. broad.

*P. barbadensis Jacq. Isle of Wight County: disturbed soil by James River, below old Fort Boykin, no. 13,741. See p. 361.

P. pubescens L. Local range extended northward. Isle of Wight County: disturbed soil in bottomland woods along Blackwater River, above Broadwater Bridge, north of Zuni, no. 13,442. James City County: calcareous fossiliferous bluff by James River, Grove Landing, southeast of Grove, no. 13,441.

Scrophularia marilandica L. Range extended into two additional Coastal Plain counties. Middlesex County: rich wooded slope by Rappahannock River, Bay Point, no. 13 443. Surry County: rich calcareous wooded ravines along James River, Claremont, no. 13,743. See p. 363.

Chelone Cuthbertii Small. Sussex County: swampy woods along Spring Creek, about 2 miles north of Henry, nos. 13,446 and 13,744.

*Bacopa **stragula,** sp. nov. (tab. 728). Planta prostrata stragulos 0.5–3 dm. diametro formans; caulibus succulentis glabris valde ramosis repentibus ramis adscendentibus; foliis crassis opacis rotundo-ovatis sessilibus subamplexicaulibus 5–10 mm. longis 3.5–10 mm. latis apice rotundatis palmatinerviis nervis obscuris; floribus axillaribus, pedicellis 3–6 mm. longis adscendentibus vel patentibus deinde arcuato-recurvatis; sepalis exterioribus cordatis rotundo-ovatis apice rotundatis 4–6 mm. longis; corollis tubulosis albescentibus 4–5 mm. longis 5-lobatis, lobis apice subtruncato-rotundatis; staminibus 3 vel 4; capsulis

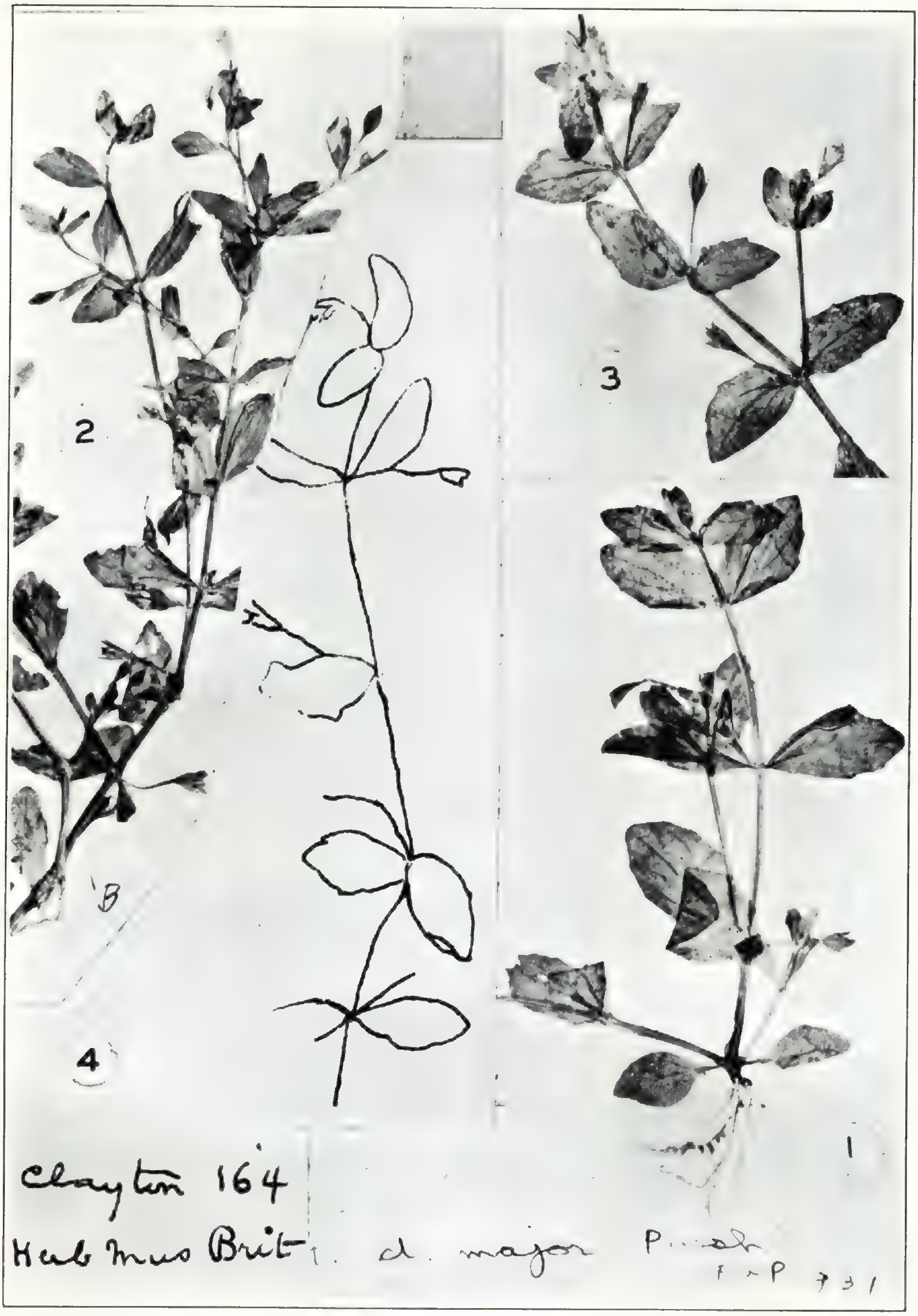

Photo. B. G. Schubert.

LINDERNIA DUBIA: portions of plants, × 1; FIG. 4, tracing of type.

Photo. B. G. Schubert.

Lindernia dubia, var. riparia: portions of plants, × 1.

ovoideis obtusis 2–4 mm. longis deinde nudis.—Fresh tidal muddy or sandy shores of rivers entering Chesapeake Bay, Maryland and Virginia. MARYLAND: Salisbury, September, 1863, *Canby*. VIRGINIA: Mattaponi River, Walkerton, September 1, 1940, *Fernald & Long*, no. 12,801; Mattaponi River at Horse Landing, near King William Courthouse, October 14 and 16, 1939, *Fernald & Long*, no. 11,613 (distributed as *B. cyclophylla* Fernald), August 31, 1940, *Fernald & Long*, no. 12,799; Mattaponi River northwest of King William Courthouse, August 31, 1940, *Fernald & Long*, no. 12,800; Chickahominy River, Walker, New Kent County, September 10, 1941, *Fernald & Long*, no. 13,746; Chickahominy River, Lanexa, New Kent County, September 13, 1941, *Fernald & Long*, no. 13,748 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); Chickahominy River, southwest of Windsor Shades, New Kent County, October 12, 1941, *Fernald & Long*, no. 14,010; Chickahominy River near Cypress Bank Landing, Charles City County, July 26, 1941, *Fernald & Long*, no. 13,447; Chickahominy River, Graves Landing, north of Holdcroft, Charles City County, September 10, 1941, *Fernald & Long*, no. 13,745; Chickahominy River, Wilcox Neck, Charles City County, September 13, 1941, *Fernald & Long*, no. 13,747; Chickahominy River, Matahunk Neck, Charles City County, October 12, 1941, *Fernald & Long*, no. 14,011. See pp. 355, 356 and 368.

Our earliest collection from Virginia was misidentified as *Bacopa cyclophylla* Fernald in RHODORA, xli. 446 (1939) = *Herpestis rotundifolia* Gaertn. f. (1807) not *Bacopa rotundifolia* (Michx.) Wettst. (1891); and Pennell, Scroph. E. Temp. N. Am. 69 (1935), cited the Maryland material of Canby as *Herpestis rotundifolia*. That species, however, is thin-leaved, the blades of the primary axes mostly 1–1.5 cm. long, the branches closely but minutely pilose, the pedicels up to 8 mm. long and pubescent, the stamens 2. So far as I can determine (and the translucent leaves of specimens are confirmatory), *Bacopa cyclophylla* (*Herpestis rotundifolia*) is aquatic or subaquatic; on the other hand, the new *B. stragula*, with thick and opaque leaves, glabrous branches, and 3 or 4, instead of 2, stamens, is a plant of tidal mud and sand. *B. cyclophylla* is apparently unknown from north of southeastern North Carolina, my statement in RHODORA, xlii. 479, 480 (1940), that our first known Virginia station connects "that at Wilmington, North Carolina, with the two in eastern Maryland" having been based on the misidentifications above referred to.

It is not clear to which of Pennell's segregates of *Bacopa* the new *B. stragula* belongs. By his treatment, l. c. 49 et seq., he then recognized three genera of the inclusive *Bacopa* with ebracteolate pedicels. These he separated by the following key:

"G. Capsule globose or ovoid, nearly equaling the sepals; outer sepal orbicular-oval to oblong.
H. Corolla 7–8 mm. long [in the key to species on p. 57 two of the three species are said to have "corolla 5–7 mm. long", the third "corolla 3–4 mm. long"], 5-lobed (because the two posterior and the 3 anterior lobes are all distinct); stamens 4; leaf-blades entire . 3. *Macuillamia*
HH. Corolla 2 mm. long, 3-lobed (because the 2 posterior lobes have united, and the anterior petal is lost, so leaving the anterior lip 2-lobed); stamens 3; leaf-blades repand . . . . 4. *Hydranthelium*
G. Capsule ellipsoid-ovoid, much shorter than the sepals; outer sepal orbicular-cordate; stamens 2 . . . . 5. *Herpestis*"

However, in the "Annotations and Corrections" at the end of the volume (p. 630) Pennell admitted "a species of *Macuillamia* . . . which showed corollas either 4- or 3- [in addition to 5-] lobed and stamens either 4 or 3 in number, thus bridging the supposed gap [supposed only as Pennell originated this departure from conventional practice] between these groups [*Macuillamia* and *Hydranthelium*]. Moreover, the species of *Hydranthelium* from Mazatlan bore entire leaf-blades, just as given in my key for *Macuillamia*. It is evident that the former species of *Hydranthelium* are to be considered merely as florally reduced members of a common genus for which the name should be *Hydranthelium*"; whereupon the species of *Macuillamia* were formally transferred to *Hydranthelium*.

With *Hydranthelium* thus absorbing *Macuillamia*, having the corolla 3-, 4- or 5-lobed and stamens either 3 or 4, we have left as reputed "generic" differences: *Hydranthelium* with the ovoid (or globose) "capsule nearly equaling the sepals; outer sepals orbicular-oval or oblong" and stamens 3 or 4; *Herpestis* with "Capsule ellipsoid-ovoid, much shorter than the sepals; the outer sepals orbicular-cordate; stamens 2." But now comes the limnophilous new *Bacopa* to muddy the supposedly clear water; for in *B. stragula* the short capsule and the cordate-rotund outer sepals are those of only 2-stamened *Herpestis* (as defined), the 5-lobed corolla is that either of *Herpestis* or of *Hydranthelium* (as revised by taking in *Macuillamia*), but the 3 or 4 stamens put *B. stragula* into readjusted *Hydranthelium*, which is now con-

ceded to have either 3 or 4 stamens. If the number of stamens, whether 2 in *Herpestis* or 3 or 4 in *Hydranthelium,* is all that is left, there is little to separate these two reputed genera.[1] Incidentally, the newly described plant with 3 or 4 stamens but with cordate-rotund outer sepals and short capsule superficially more closely resembles *Herpestis rotundifolia* than the species placed by Pennell in *Hydranthelium.* In view of this author's recently announced preference for superficial or habital aspect as taxonomically superior to morphological differences in flower, fruit and seed, it is assumed that *Bacopa stragula*[2] might perhaps find its place in *Herpestis.* In his recent paper on *Scrophulariaceae of Trans-Pecos Texas,* Proc. Acad. Nat. Sci. Phila. xcii. 301 (1940) Pennell said, in discussing *Maurandya Wislizeni:* "Recently Dr. P. A. Munz (in Proc. Calif. Acad. Sci. IV. 15: 380, 1926) has revived Engelmann's proposed genus *Epixiphium* for this species; this was based wholly upon the fruiting characters (the accrescent sepals, the peculiar capsule, style, and seeds), but the flowering state and the habit of the plant are so similar to other species of *Maurandya* as to make such a segregation in my opinion undesirable". All sorts of possibilities suggest themselves if floral and fruiting morphology are to give way to habital aspect, a play to superficial ecology. How such sound morpholo-

[1] Those who make the artificial separation of these from *Bacopa* Aubl. (1775) should note that *Herpestis* Gaertn. f. (1807) has priority over *Hydranthelium* HBK. (1825) to which the species of *Macuillamia* Raf. (1825) have been transferred.

[2] In giving to *Bacopa stragula* this specific name I am using a common Latin adjective, found in most dictionaries of that language and meaning *forming a mat or carpet.* The first time I used this specific name was when I described an *Astragalus* (*A. stragulus*) of northern Newfoundland, which formed a dense and intricately woven carpet. Comparing it with a species of Jones (Marcus E.), I referred to his key-statement and diagnosis being perplexingly contradictory. This was enough for that militant warrior. He promptly announced that "The name straga[u]lus should not be used because it does not correspond phonetically with the genus name, and because there is no such adjective as stragalus in Latin, a fact that Fernald ought to know". Had Jones looked up the specific name *stragulus,* which was used, he could have found it. Continuing, he wrote: "He might have used stragalarius, or stragalensis, but has little authority for using a noun as an adjective, and none in a way that means nothing. Fernald recently seems afflicted with that disease known as 'caput intumescens'."—M. E. Jones, Contrib. to Western Bot. No. 15: 15 (1929). As to the latter disease, it was placed upon him by no other infector than the revered and universally loved Bailey, for the first plant with which the victim's name was publicly associated was discovered by him while still in his teens and named *Carex intumescens,* var. *Fernaldii* by Bailey. What a pity that so great and so generous a man could not have foreseen the life-long infection he was starting! If the species had only been any but *C. intumescens* (inflated)—*C. aenea* (brassy), *C. nervosa* (nervy), *C. torta* (twisted), *C. molesta* (troublesome), *C. Jonesii* (for Marcus Jones), *C. incomperta* (unknown), or almost any other—the calamity might have been avoided.

gists as Bentham, Engelmann, Gray or Wettstein would have cringed at such sophistry!

Plate 728 is of Bacopa stragula: fig. 1, portion of plant, × 1, from Graves Landing, north of Holdcroft, Virginia, *Fernald & Long*, no. 13,745; fig. 2, portion of type, × 1; figs. 3 and 4, flowers, × 3, from Salisbury, Maryland, *Canby;* fig. 5, corolla, laid open, × 10, from type (the anther at the right partly hidden under the lobe to the left, the next anther broken in desiccating); fig. 6, bud with 3 stamens, laid open, with ovary turned down, × 10, from type.

*B. **simulans,** sp. nov. (tab. 729). Planta decumbens basi radicans vel suberecta; caulibus succulentis glabris simplicibus vel sparse ramosis 0.5–2 dm. altis; foliis crassis subopacis rotundo-obovatis vel ellipticis apice rotundis 1–2 cm. longis 6–15 mm. latis palmatinerviis nervis obscuris; floribus axillaribus solitariis vel binis, pedicellis crassis rectis vel falcatis deinde divergentibus vel reflexis ad 5–11 mm. longis; sepalis exterioribus late ovatis apice rotundatis arctis 4–5.5 mm. longis; corollis tubulosis albescentibus 4 mm. longis 5-lobatis, lobis tubo aequantibus apice emarginatis, fauce flavo; staminibus 4 inclusis, antheris atropurpureis; capsulis ellipsoideis inclusis.—Charles City County, Virginia: sandy-muddy fresh tidal shore of Chickahominy River, Graves Landing, north of Holdcroft, September 10, 1941, *Fernald & Long*, no. 13,749 (type in Herb. Gray; isotype in Herb. Phil. Acad.); three plants collected by *E. J. Grimes* and mislabeled *Echinodorus tenellus* (no. 4135[1], cited by Pennell as 4136), the exact locality now obscure, the plants identified by Pennell as *Macuillamia obovata* Raf.

Although the hopelessly mislabeled specimens collected somewhere, presumably by Grimes (see discussions on pp. 355 and 368) have been taken by Pennell, Scroph. E. Temp. N. Am. 60 (1935) as *Macuillamia obovata* Raf., therefore *Hydranthelium obovatum* (Raf.) Pennell, l. c. 630, and *Bacopa obovata* (Raf.) Fernald in Rhodora, xxxix. 475 (1937), there is very great doubt whether Rafinesque ever saw this species. Here is Rafinesque's account.

"333, *Macuill. obovata* Raf. glabr. vel hirsuta prostrata non flex. fol. obov. vel. ellipt. sessilib. obt. ped. fol. brevior. caps. globosa.—Virginia in the River Potomac. and in Louisiana, larger plant, leaves semiuncial". —Raf. Aut. Bot. 44 (1840).

[1] In the Gray Herbarium the material, clearly numbered 4135 and called *Echinodorus tenellus* from Lanexa, is *Sagittaria subulata;* on the label at New York the last digit is poorly typed, so that Pennell has cited it as 4136. In her *Flora of the Peninsu.a of Virginia*, Papers Mich. Acad. Sci, Arts and Lett. iv. 120 (1924) Eileen Whitehead Erlanson (formerly Mrs. Grimes) listed no. 4135 as *Echinodorus tenellus* and no. 4136 as *Eriocaulon Parkeri*. In the Gray Herbarium, likewise, no. 4136, the label written by Grimes, is *Eriocaulon*.

Photo. B. G. Schubert.

LINDERNIA DUBIA, var. INUNDATA, all × 1.

Photo. B. G. Schubert.

Melampyrum lineare: figs. 1–3, × 1, fig. 4, × 2; fig. 1, summit of Desrousseaux's type, photo after *Cintract*.

As Pennell, l. c. 60, states, no type of Rafinesque's species is known to exist, "certainly none in herbaria of the United States or in the Durand Herbarium . . . at Paris". To these can be added Geneva, for Dr. Hochreutiner writes me that there is nothing of it in the great herbaria there, which have many of Rafinesque's plants. Pennell, recognizing that Rafinesque's *M. obovata* was a probable mixture, attempted to sort out from among the few stated characters some for the plant of the Potomac, some for the plant of Louisiana. At best, however, there is little about Rafinesque's account to make it really safe, in the absence of actual specimens, thus to apportion the points between Louisiana and the Potomac and to apply the resultant name to a plant known only as a highly localized species at the head of tide on the Chickahominy, nearly 100 miles up-river from Chesapeake Bay and, following the isolated fresh tidal shores, several times that distance, around the forbidding saline shores, from the fresh estuary of the Potomac. *Bacopa simulans* is certainly not "prostrate", nor is its slenderly ellipsoid capsule "globose"; and its pedicels are not sufficiently "shorter than the leaves" as to attract notice. The generic account of *Macuillamia* by Rafinesque, Neogen. 2 (1825), called for "cor. four cleft". Since the plant of the Chickahominy, *Bacopa simulans,* has the corolla 5-cleft, it seems like a forced misinterpretation of Rafinesque's confused account to identify it with his *Macuillamia obovata*, with prostrate stems, short pedicels, 4-cleft corolla and globose capsules. I apologize for having so ignorantly made the needless combination *B. obovata.*

If one is seeking a plant presumably of the Potomac or of tidal rivers entering Chesapeake Bay north of the mouths of the Chickahominy and the James, with obovate leaves, pedicels much shorter than the leaves, corolla 4-cleft, and globose capsule, he can find it in *Gratiola virginiana* var. *aestuariorum* Pennell (see PL. 730, FIG. 3), a plant which, repeatedly overflowed by tidal water, may be quite depressed or prostrate. Var. *aestuariorum* is cited by Pennell, l. c. 630, as extending northward to the Delaware drainage.

Returning to *Bacopa simulans,* the name is given from its habital resemblance to *B. rotundifolia* (Michx.) Wettst. That usually coarser and prostrate aquatic of fresh water, chiefly of

the Mississippi drainage, however, has the stems copiously hirsute, the thin and clearly nerved leaves more rounded, the larger ones 2–3.5 cm. long and 1.5–2.7 cm. broad, the slender and pubescent pedicels 0.8–2 cm. long, the rather showy campanulate corolla 6–8 mm. long, with wide-spreading limb about as broad. *B. simulans*, on the other hand, is a relatively small, merely decumbent to erect plant of tidal shore, with glabrous stems and pedicels, the more opaque leaves only 1–2 cm. long and 0.6–1.5 cm. broad, the thick pedicels at most 11 mm. long, the insignificant corolla 4 mm. long and 2 mm. broad.

Plate 729 is of Bacopa simulans, from the type-material: fig. 1, habit, × 1; fig. 2, corolla, laid open, × 10.

*Gratiola virginiana L., forma **acutidens,** f. nov. (tab. 730, fig. 1 et 2), robusta 3.5 dm. alta; foliis primariis lanceolato-acuminatis 6–7 cm. longis divergente serrato-dentatis, dentibus lanceolatis vel lanceolato-falcatis 3–6 mm. longis; sepalis 8–9 mm. longis capsulis valde longioribus.—Henrico County, Virginia: "Manchester", opposite Richmond, May 7, 1894, *J. R. Churchill* (type in Herb. Gray.).—An extraordinarily robust form, differing at once from typical *G. virginiana* (figs. 4 and 5) in its large and long-attenuate leaves with long and slender teeth, and in the sepals strongly overtopping the capsule.

*G. virginiana, var. aestuariorum Pennell. King and Queen County: fresh tidal marsh of Mattaponi River, Walkerton, no. 13,143. King William County: fresh tidal marsh of Pamunkey River, Sweet Hall, nos. 13,142 and 13,144. New Kent County: fresh tidal marsh by Chickahominy River, southeast of Windsor Shades (Boulevard Postoffice), no. 13,454. Nansemond County: muddy rill in swampy woods east of Milk Landing, south of South Quay, no. 11,428. See p. 356 and plate 730, fig. 3.

Var. *aestuariorum*, based by Pennell upon material from Salisbury, Maryland, was described as "erect, with closely ascending branches. Leaf-blades oval, 1.5–2.5 cm. long, crenate-undulate to entire. Pedicels less than 1 mm. long, so that the flowers are nearly sessile. Capsule 3–4 mm. long." An isotype before me conforms to this description and our nos. 13,142 and 13,143 well agree with it, except that they have pedicels 3–5 mm. long. Other material (Salisbury, Maryland, October 3, 1863, *Canby*, and our nos. 11,428 (fig. 3) and 13,454), all with sessile or nearly sessile fruits, is depressed and widely branching at base. It is far more extreme than the type. Typical or at least ordinary

G. virginiana has the upper or bracteal leaves lanceolate to oblong or narrowly elliptic and subacute to acute, only rarely quite obtuse. It is a thin-leaved plant, often with pedicels 0.8–1.3 cm. long (FIG. 4) but not rarely with the flowers subsessile (FIG. 5). As the fuller collections from tidal shores and their vicinity seem to indicate, the plant of such habitats consistently has the upper leaves blunt or rounded at tip and varying from elliptic to obovate. They are, naturally, of fleshy texture. With this extended meaning I am maintaining var. *aestuariorum*. It is not without significance, however, that *G. virginiana* L. Sp. Pl. i. 16 (1753) rests exclusively on the plant, no. 379, of Clayton, "*Gratiola foliis lanceolatis obtusis vix dentatis*". When in 1917–18 Blake (RHODORA, xx. 65) and in 1930 Pennell saw the type they presumably did not recognize the common inland plant and var. *aestuariorum*, published in 1935, as separable. The latter can hardly be described as having the leaves lanceolate; states of the former could. The Gloucester County specimens noted by Pennell, Scroph. E. Temp. N. Am. 92 (1935), *Pennell*, no. 12,700, as coming from "close to the home of John Clayton", have the leaves oval to obovate and obtuse and the fruits nearly sessile. A good photograph of the type of *G. virginiana* is in order, when the Clayton plants become available.

In PLATE 730, FIGS. 1 and 2 are from the type of GRATIOLA VIRGINIANA, forma ACUTIDENS, × 1; FIG. 3, summit of var. AESTUARIORUM, × 1, from near Milk Landing, south of South Quay, Virginia, *Fernald & Long*, no. 11,428; FIG. 4, fruiting node, × 1, of G. VIRGINIANA, from Norfolk, Virginia, May 3, 1894, *Churchill*, identified by Pennell; FIG. 5, summit of G. VIRGINIANA, × 1, from Louisiana, *Hale*, validated by Pennell.

ANOTHER INTERPRETATION OF LINDERNIA DUBIA (PLATES 731–733). In his Scrophulariaceae of Eastern Temperate North America (Acad. Nat. Sci. Phila. Mon. i), 137, Pennell, in a healthy spirit of conservatism, reduced *Ilysanthes* Raf. (1820) to *Lindernia* All. (1766). With this reduction all who are of conservative mood will agree. The first American species described in the group was *L. dubia* (L.) Pennell, l. c. 141, resting upon *Gratiola dubia* L. Sp. Pl. i. 17 (1753), "*Habitat in* Virginiae *aquosis*", *G. dubia* resting for typification upon *Clayton*, no. 164, which had been described by Gronovius, Fl. Virg. ii. 129 (1743), "*GRATIOLA floribus pedunculatis, foliis ovatis crenatis*", this diagnostic phrase taken over directly by Linnaeus.

Ilysanthes dubia consists of three clearly intergrading varieties, two of fresh to barely brackish mud and shores, one of tidal shores. The last variety, well characterized by its elliptic to obovate round-tipped leaves, and nearly always cleistogamous flowers on pedicels only 1–5 (very rarely –10) mm. long, the pedicels much shorter than the bracteal leaves. This is var. *inundata* (Pennell) Pennell, l. c. 150 (1935), resting upon his earlier (1919) *Ilysanthes dubia inundata.* In some ways the most extreme trend in the species, var. *inundata* is shown in PLATE 733.

The other two varieties have the bracteal leaves more tapering at apex, merely bluntish or acute, not strongly rounded and obovate. In the plant which Pennell considers typical *L. dubia* (PLATE 732) the bracteal leaves become, as the axes prolong, strongly reduced in size. They are then lanceolate to lance-ovate or oblong and only 1–6 mm. broad, and exceeded by the upper pedicels which range from 0.5–2 cm. long. In this plant the larger foliage-leaves are narrowly elliptic or narrowly ovate and gradually narrowed to base (I find no justification for Pennell's characterization (l. c. 142) of them as "cuneate"); furthermore, all but the latest flowers have expanded corollas, though late in the season they may be cleistogamous. As Pennell says (l. c.) "integradation is complete between *L. dubia major* and *L. dubia typica*"; he therefore treats them as "subspecies", a degradation of an honorable term clearly exposed in RHODORA for May of this year. But, on the whole, *L. dubia major* (Pursh) Pennell, as subsp., l. c. 146, is a reasonably good variety (PLATE 73). Its most conspicuous character is the nearly uniform foliage-leaves and bracts. The latter are only slightly or scarcely smaller than the former, with more gradually rounded bases (therefore ovate) and less acute tips. They consistently overtop the pedicels, the latter ranging from 0.5–1.7 cm. long, the upper bracts being 5–10 mm. broad. This plant produces normal expanded corollas until late in the season. In its aggregate of characters it stands midway between Pennell's *L. dubia* subsp. *typica* and his var. *inundata*, and it frequently ventures, without more serious alteration than becoming of more fleshy texture, upon tidal shores, just as the obovate- and obtuse-leaved var. *inundata* will sometimes stray slightly from tidal flats and, getting into deep shade, become thin-leaved and etiolated.

On the whole the three varieties of *Lindernia dubia* are reasonably well marked. It seems to me, however, that, in defining the three, Pennell over-stressed the "cuneate" base of the leaf in his *L. dubia typica* and that his recollection of the Linnean type must have been obscured by time. Pennell (l. c. 41, 42) wrote: "Based primarily upon Clayton 164, which I have seen in the Clayton Herbarium of the British Museum (Natural History) in London. In this the leaf-blades are nearly all narrowed to base, yet the spreading pedicels were 15 mm. long—a combination of characters that denotes the prevalent plant of the Central Lowland . . . As the authors of both our recent northeastern manuals have been unaware of the plant now considered with its combination of cuneate leaf-blades with long pedicels, it is natural that . . . Dr. Robinson (Gray's New Man. ed. VII. 725. 1908) stressed instead the cuneate lower leaves and so applied the name to what I am now calling *L. dubia major*." It so happens that the joint editors of Gray's Manual, ed. 7, were Robinson & Fernald and, by a division of responsibility agreed upon, each of us "did" certain groups. Joint authorship, however, was assumed for all groups, and I do not find any mention in the treatment in the *Manual* of "cuneate" leaves in *L. dubia*. Instead, this is the unaltered text: "leaves ovate, rounded, or oblong, . . . the upper partly clasping, the lower more or less narrowed to base".[1] This description was checked by a tracing (PLATE 731, FIG. 4) of Clayton's no. 164, TYPE of the species, sent by Mr. Edmund G. Baker to the Gray Herbarium. Although a poor fragment, the tracing of *Clayton* no. 164 shows the lower bracts oval and rounded at base as in *L. dubia major* (Pursh) Pennell. This is quite in agreement with the "*foliis ovatis crenatis*" of Gronovius and of Linnaeus. *Cuneate*, from *cuneus*, a wedge, implies straight lines converging to the basal angle. Anyone who tried to use a wedge with the rounded sides of the lower bracts of the type of *Gratiola dubia* would have his work cut out for him. It seems to me that the type of *Gratiola*

[1] Somewhat earlier Dr. Robinson had discussed the type of *Gratiola dubia* L. He did not note "cuneate" leaves but said: "To make sure of this identity the writer applied to Mr. E. G. Baker of the British Museum of Natural History to examine the still extant specimen of Clayton. This he most kindly did and sent a tracing of it to the Gray Herbarium [PLATE 731, FIG. 4] showing conclusively its identity with the larger-leaved relatively shorter-pediceled form, which Dr. Small has called *I[lysanthes] attenuata*".—Robinson in RHODORA, x. 67 (1908).

dubia, therefore of *Lindernia dubia*, was a fragment of the plant which Pennell calls *L. dubia major*. When the actual specimen can be examined we may possibly find that Gronovius and, after him, Linnaeus were in error in describing the "foliis ovatis"; they certainly did not say "cuneatis". My faith, however, based upon long experience with their precision, is such that I am treating as typical *L. dubia* the plant treated by Pennell as *L. dubia major*. I am, therefore, taking the chance of overloading synonymy by calling the plant with much reduced upper bracteal leaves equaled or overtopped by the upper pedicels

Lindernia dubia (L.) Pennell, var. **riparia** (Raf.) comb. nov. *Ilysanthes riparia* Raf. Ann. Nat. 13 (1820). *L. dubia typica*, sensu Pennell, Acad. Nat. Sci. Phila. Mon. i. 141 (1935), not *Gratiola dubia* L. Sp. Pl. i. 17 (1753). Plate 732.

As to the type locality of *Gratiola dubia*, Linnaeus said only Virginia and Clayton and Gronovius gave nothing more definite. In view of Clayton's well known trips far from Gloucester County it could have come from a remote area, although it is frequent enough in the eastern counties. Pennell seems to have inferred that the type came from Gloucester County. At least, as coming from "Near type locality", he has distributed tiny plants (plate 733, fig. 3) from a "wet draw in forest" near James Store, Gloucester County, *Wherry & Pennell*, no. 12,698, as *Ilysanthes dubia*, although in his later treatment he called it *Lindernia dubia* subsp. *major*. The specimens are tiny, obviously etiolated from growing in the woods, with unusually long petioles, with obovate blades broadly rounded above, with pedicels very short, and the label bears the note: "Corolla falling unopened". Why is it not an etiolated woodland development of *L. dubia*, var. *inundata* (plate 733, figs. 1 and 2) which was described with "Leaf-blades oval, all broadly rounded or obtuse; fruiting pedicels 3–5 mm. long; only the earliest corollas, if any, opening . . . nearly all the corollas falling unopened and the flowers habitually self-pollinated . . . ; plant erect"? No. 12,698 meets all these requirements; it strongly contradicts the definition of *L. dubia major* (plate 731), under which it is cited: "Leaf-blades oblanceolate to ovate-lanceolate, usually only the lower obtuse or rounded at apex; fruiting pedicels at least 5 mm. long; earlier corollas habitually opening; plant diffuse".

Of the plant (PLATE 732), with reduced upper bracts and prolonged pedicels, *Lindernia dubia*, var. *riparia*, the *L. dubia typica* of Pennell, "the prevalent plant of the Central Lowland which from the Ohio valley crosses the Appalachians through the Potomac valley to the Chesapeake Bay of Virginia" (Pennell, l. c. 141), it is a striking fact that in his enumeration of specimens Pennell cited from all Virginia only a single collection and that from Fairfax County, in the extreme northeast; but for the plant which he did not consider to be typical *L. dubia* (his *L. dubia major*) he had a whole paragraph of Virginia citations, including specimens from many of the eastern counties where the plant abounds: Hanover, Northampton, Warwick, Mathews, James City, Norfolk, Princess Anne and others. If it is right to assume that Clayton would have collected the commonest variation of the species "*in* Virginiae *aquosis*", it is natural to believe that he would get the *commonest* variation!

As stated, in southeastern Virginia typical *Lindernia dubia* (*L. dubia*, subsp. *major* Pennell) is common. Besides the counties cited by Pennell the following are represented by our specimens: Nansemond, Southampton and Greensville.

Var. RIPARIA (Raf.) Fernald. Our only collections from the tidewater counties are as follows. JAMES CITY COUNTY: moist soil, site of old pond, ½ mile south of Ewell, *Grimes*, no. 4489 (see FIG. 2), cited by Pennell as the latter (his subsp. *major*). PRINCESS ANNE COUNTY: clay ditches bordering pine woods, Virginia Beach, no. 4179. GREENSVILLE COUNTY: wooded bottomland, Fontaine Creek, southwest of Haley's Bridge, no. 14,014, late flowers, on October 14, all cleistogamous (FIG. 3).

Var. INUNDATA Pennell. To the two Virginia stations cited by Pennell add the following. GLOUCESTER COUNTY: wet draw in forest, James Store, *Wherry & Pennell*, no. 12,698 (see FIG. 3). CAROLINE COUNTY: sandy and muddy tidal shore of Rappahannock River, northwest of Return, no. 14,016. KING WILLIAM COUNTY: fresh tidal shore of Mattaponi River, at Horse Landing, near King William Courthouse, no. 11,612. NEW KENT COUNTY: fresh tidal marsh by Chickahominy River, southeast of Windsor Shades (Boulevard Postoffice), no. 13,453, plants in shade, leaves thin and dilated and pedicels elongate. CHARLES CITY COUNTY: fresh tidal shore of Chickahominy River, Matahunk Neck, no. 14,015; sandy tidal margin of Chickahominy River, Ferry Point, no. 11,141; sandy tidal shore of James River at "Four Oaks", below Harrison Point, no. 11,427. SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. 12,803. PRINCE

GEORGE COUNTY: muddy tidal shore of James River, Jordan Point, no. 9430. See p. 356.

PLATE 731 is of LINDERNIA DUBIA (=subsp. *major* Pennell), all × 1: FIG. 1, small plant from Hanover, New Hampshire, July 14, 1910, *E. F. Williams;* FIG. 2, portion of plant from Louisiana, *Hale*, identified by Pennell as subsp. *major;* FIG. 3, flowering tip from Marshall, Madison County, North Carolina, *Wherry & Pennell*, no. 14,254, cited by Pennell as subsp. *major;* FIG. 4, tracing of type of GRATIOLA DUBIA L. (cf. fig. 2).

PLATE 732 is of LINDERNIA DUBIA, var. RIPARIA, all × 1: FIG. 1, from Vienna, Illinois, *Gleason*, no. 2640; FIG. 2, portion of plant from south of Ewell, Virginia, *Grimes*, no. 2289, but cited by Pennell under his subsp. *major;* FIG. 3, tips (cleistogamous) of plant from Fontaine Creek, southwest of Haley's Bridge, Greensville County, Virginia, *Fernald & Long*, no. 14,014.

PLATE 733 is of LINDERNIA DUBIA var. INUNDATA, all × 1: FIG. 1, portion of TOPOTYPE, from Delair, New Jersey, *Pennell*, no. 6496; FIG. 2, portion of loosely spreading plant from below Harrison Point, James River, Virginia, *Fernald & Long*, no. 11,427; FIG. 3, three etiolated woodland plants from James Store, Gloucester County, Virginia, *Wherry & Pennell*, no. 12,698, distributed as typical *Ilysanthes dubia* (L.) Barnhart (*Gratiola dubia* L.) from "near type locality" of *G. dubia*, but later cited as *L. dubia* subsp. *major*.

MICRANTHEMUM MICRANTHEMOIDES (Nutt.) Wettst. Range extended south from the Potomac to fresh tidal shores of the Chickahominy. NEW KENT COUNTY: Walker, no. 13,752; Lanexa, no. 13,754. CHARLES CITY COUNTY: Cypress Bank Landing, nos. 13,380 and 13,750; Graves Landing, north of Holdcroft, no. 13,751; Wilcox Neck, no. 13,753. See pp. 356 and 368.

M. UMBROSUM (Walt.) Blake. Range extended into GREENSVILLE COUNTY: on logs and at muddy margin of Fontaine Creek, southwest of Haley's Bridge, no. 14,013. A new station in SOUTHAMPTON COUNTY: sandy alluvial bottomland of Three Creek, Adams Grove, no. 14,403. See pp. 367 and 375.

*GERARDIA FLAVA L., var. RETICULATA (Raf.) Cory. Extended north from North Carolina. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, no. 5033. ISLE OF WIGHT COUNTY: dry sandy oak woods, southeast of Zuni, no. 14,018. SUSSEX COUNTY: sandy alluvial woods, bottomland of Nottoway River, southwest of Burt, no. 6392 (as *G. laevigata*); rich woods by Nottoway River, southeast of Stony Creek, no. 13,757. Exsiccated argillaceous pineland about 2 miles east of Stony Creek, no. 9144. PRINCE GEORGE COUNTY: dry sandy woods and clearings about 3 miles southeast of Petersburg, at head of Poo Run, no. 6693. CAROLINE COUNTY: wooded alluvium of Mattaponi River, south of Milford, no. 7603 (as *G. laevigata*). The early misidentifications kindly corrected by Dr. Pennell.

G. PURPUREA L., forma ALBIFLORA Britton. SOUTHAMPTON COUNTY: damp clearing in woods along Blackwater River, east of Oak Grove School, no. 13,758.

THE AUTHORSHIP OF MELAMPYRUM LINEARE, VAR. LATI-

FOLIUM (PLATES 734–736).—The name *Melampyrum latifolium,* with no word of description but merely with a translation of the name, "broad-leaved", just as all trivial names in the work were translated or explained ("Pennsylvanica . . . Pennsylvanian"; "ovata ovate-leaved"; "leptostachya . . . small-flowered" [the original "translation" by Muhlenberg]; "phrymoides phryma-like"; "spuria . . . spurious"; "officinalis . . . officinal"; "bracteosa . . . leafy"; "paniculata . . . panicled"; "coccinea . . . scarlet"; "pallida pale"; "crista galli . . . cock's comb"; "rotundifolia round-leaved" and "euphrasioides [like] eyebright") occurred in Muhlenberg, Cat. 57 (1813). As stated, it had no word of specific diagnosis and merely the statement of habitat, "Delaw." Although from Muhlenberg's translation of the trivial name and the Latin name itself it is possible for those who glorify vague publication to argue that his trivial name was equivalent to a description, it certainly cannot be urged that the parallel cases in the same column, "eyebright", "American" "officinal" and "spurious" were new diagnoses.

In Acad. Nat. Sci. Phila. Mon. i. 512 (1935) Pennell credits the proper publication of *Melampyrum latifolium* to Muhlenberg as validated by Eaton, Man. ed. 2: 316 (1818). It is, therefore, rather unedifying to see just what Eaton actually said: "*latifolium* (C[1]) leaves broad. I have no description of this species, nor a specimen". That is all! If, by merely repeating as "leaves broad" Muhlenberg's original translation of *latifolium,* "broad-leaved", and explicitly stating that he had no description nor specimen to stand for it, Eaton was guilty of publishing an intelligible diagnosis, why should those who are satisfied by such unnutritious matter ever go to the trouble to write a real diagnosis? In his Flora Ludoviciana Rafinesque based his half-imaginary descriptions only upon Robin's impressionistic accounts, although he did not have the plants before him. Rafinesque, who is not a good model, at least had plenty of words; Eaton in ed. 2 had no words of description, had seen none and had no specimen and honestly admitted the fact.

The first time that Eaton gave anything resembling a diagno-

[1] Meaning, according to Eaton's explanation (p. 120) "Columbia college. Plants which grow about New York".

sis of the broader-leaved plant was in his ed. 3: 350 (1822), when he recognized a single species, *Melampyrum americanum* Michx., properly defined, with "lower leaves linear entire; floral ones lanceolate, toothed behind", etc., and under it, without any mention of Muhlenberg, "Var. *latifolium*, has very broad leaves". That met the minimum requirements and is a description, because associated, as a variety, with a described species; but it was not the first valid publication under the name *latifolium*.

In his Monograph (1935) Pennell, arguing that "subspecies" and "varieties" are the same, took up for the plant in question the trinomial "*Melampyrum lineare latifolium* (Muhlenb.)", wrongly ascribing it to Beauverd in Mém. Soc. Phys. et Hist. Nat. Genève, xxxviii. 474 (1916); wrongly, because Beauverd definitely called the plant "Var. α. *latifolium*", because Muhlenberg had given no diagnosis, therefore can hardly be recognized as the author of a validly published name, because Beauverd did not consider it a subspecies and because the latter author did not disguise the rank of the plant by the obscure trinomial. Beauverd correctly understood and discussed the differences between true subspecies, varieties and forms, having a special chapter upon these categories, and dividing the Old World *M. pratense*, for example, into two subspecies and these into varieties and forms. Exact bibliography would not quote him as doing what he intentionally did not do. The first treatment of the plant in question as a subspecies was in 1927, when it was called *M. lineare*, subsp. *latifolium* Soó in Fedde, Repert. Spec. Nov. xxiv. 189 (1927).

In all these treatments the monographers seem entirely to have ignored the first legitimate publication of *Melampyrum lineare*, var. *latifolium*. Barton, in his time a well known Philadelphia botanist, recognized *M. lineare* and under it properly published β. *latifolium* Barton, Compend. Fl. Phila. ii. 49 (1818), with no word of reference to Muhlenberg, with "all the leaves lanceolate". This antedates by 98 years the similar varietal combination of Beauverd and by 112 years the same combination by Farwell; but, going back still farther, to Barton, Fl. Phila. Prodr. 64 (1815), we find a series of columns somewhat parallel with those of Muhlenberg's Catalogus, the second column giving translations or explanations of the Latin names ("ovalifolia . . . oval, or elliptic-leaved"; "Pennsylvanica . . . Pennsylva-

nian"; "spuria . . . spurious"; etc.) and, farther to the left, columns giving specific characters. At the bottom of p. 64 occurs *Melampyrum Americanum* Michx., var. β. *latifolium*, characterized as having a white corolla and "foliis lanceolatis". That was a definite diagnosis, not a mere translation of the Latin; it antedates Barton's *M. lineare*, var. *latifolium* by three years and was, apparently, the first diagnosis of the plant.

Although somewhat arbitrarily divided into varieties, nevertheless the typical developments of these plants are distinctive, and each has its chief area of concentration: typical *Melampyrum lineare* the most northern, not extending south of the northernmost states and at its southern limit, in northern New England, principally on peaty mountain-summits between 2000 and 4400 feet high; var. *americanum* more southern; var. *pectinatum* decidedly eastern, occurring chiefly on the Coastal Plain from eastern Massachusetts to Virginia, but locally inland; and var. *latifolium*, the broadest-leaved plant, eastern, with concentration largely on the Piedmont and Appalachian region south to Georgia. The following key to them may be of service.

a. Principal leaves of primary axis linear to narrowly lanceolate, 1–10 mm. broad; mature internodes separating the 2 lowest fruiting nodes of the primary axis 0.5–3 cm. long; lowest bracteal leaf of primary axis 1–4 (–6) cm. long and 1–10 (–20) mm. broad. . . . *b.*

b. Stem simple or loosely few-branched, 0.5–2 dm. high, the simple branches only 1–10 cm. long; foliage-leaves and bracts linear, 1–4 (–6) mm. broad, all entire or the uppermost bracts rarely toothed at base; mature capsule 3–5 mm. broad . . . . *M. lineare*, var. *lineare*.

b. Stem usually bushy-branched (exceptionally unbranched), (1–) 2–5 dm. high, the branches in well developed plants 0.2–2.5 dm. long; foliage-leaves linear to lanceolate, 2–10 mm. wide; larger bracts linear-lanceolate to lance-ovate, 3–20 mm. broad, some or all of them sharply toothed at base; mature capsule 3.5–6 mm. broad.

Branches mostly simple or with few short or flexuous branchlets; foliage-leaves 2–10 mm. broad; bracts (excluding teeth) up to 20 mm. broad, the lower ones 2.5–6 cm. long; basal teeth of the middle and upper bracts shorter than breadth of bract . . . . Var. *americanum*.

Branches mostly stiffly forking, the plant thus intricately branched and very leafy with linear leaves; foliage-leaves 2–6 mm. broad; bracts (excluding teeth) 1–7 mm. broad, the lowermost 1–3.5 cm. long; basal teeth of the middle and upper bracts about as long as breadth of bract . . . . Var. *pectinatum*.

a. Principal leaves of primary axis 0.5–3 cm. broad, lanceolate to narrowly ovate; mature internode separating 2 lowest

nodes of primary axis 3–4.5 cm. long; lower foliaceous bracts of primary axis broadly lanceolate to ovate, 3–7 cm. long and 1–3 cm. broad, the bracts all toothless or the middle and upper ones with relatively short basal teeth; branches of plant few, simple or only loosely few-forked.......................................Var. *latifolium.*

M. LINEARE Desr., var. LINEARE (Desr.) Beauverd in Mém. Soc. Phys. et Hist. Nat. Genève, xxxviii. 475 (1916). *M. lineare* Desr. in Lam. Encycl. Meth. iv. 22 (1797). *M. americanum* Michx. Fl. Bor.-Am. ii. 16 (1803) in part (only the plant of Hudson Bay). *M. brachiatum* Schwein. in Keating, Narr. Exped. St. Peters R. ii. 391 (1824). *M. lineare*, var. *lineare*, forma *brachiatum* (Schwein.) Beauverd, l. c. 476 (1916). *M. lineare typicum* (as subspecies) Pennell in Acad. Nat. Sci. Phila. Mon. i. 509 (1935).—Bogs, heaths and peaty or rocky barrens, Newfoundland and southern Labrador Peninsula to northern Alberta and British Columbia, south to Nova Scotia, eastern and northern Maine, alpine areas (up to 4400 feet) of Maine, New Hampshire and Vermont, northern Michigan, northern Wisconsin, northwestern Montana, northern Idaho and Vancouver Island. PLATE 734.

Although various authors quote from the original very detailed account, they seem not, until Pennell, to have looked at the signature at the end of the treatment of *Melampyrum* in Lamarck's Encyclopedia. Most, including *Index Kewensis*, cite it without question as the work of Lamarck. Nevertheless at the end of the treatment of the genus (p. 23) acknowledgment is definitely given: "Par M. DESROUSSEAUX." In fact Desrousseaux was author of all generic treatments in the first part of the volume: from *Malvastrum* on page 1 through *Meniscium* on page 94. Then come a series of unsigned generic treatments (presumably, since not signed, by Lamarck), beginning with *Menispermum* on page 94, then *Mentha, Mentzelia*, &c., on until on page 128 "le citoyen POIRET" discussed philosophically the subject METHODE. Other genera treated were done, not by Lamarck, but by his collaborators: *Mnium* by Vintenat, others by Poiret and so on. In fact, Poiret seems to have been assigned a batch of terms or genera beginning with the French word Moelle (p. 244), continuing the articles, whether on morphology, *Mucor, Monarda*, Monocotylédons, through Monotrope (*Monotropa*). It is clear, then, that by no means all the species published in Lamarck's Encyclopedia were Lamarck's, and, although *Index Kewensis* credits him with *Melampyrum lineare*,

it correctly credits Desrousseaux with new species of *Melanthium*, *Melastoma* and some other genera for the treatment of which Lamarck gave the same acknowledgment, "Par M. Desrousseaux".

Var. americanum (Michx.) Beauverd in Mém. Soc. Phys. et Hist. Nat. Genève, xxxviii. 475 (1916). *M. americanum* Michx. Fl. Bor.-Am. ii. 16 (1803) in part. *M. lanceolatum* Raf. Aut. Bot. 160 (1840). *M. pratense*, β. *Americanum* (Michx.) Benth. in DC. Prodr. x. 584 (1846), as to source of name.—Dry woods, Anticosti Island, Quebec, to Minnesota, south to Nova Scotia, New England, Long Island, Maryland and upland to North Carolina and Tennessee; northwestern Montana and northern Idaho. Plate 735.

Michaux made no differentiation of the variations, calling them all *Melampyrum americanum* "a sinu *Hudsonis* ad montosam Carolinam". The material preserved at Paris was studied by me in 1903 and a photograph of it is before me. It consisted of a mixture of immature possible *M. lineare*, already published by Desrousseaux in 1797, and a plant and fragment (figs. 1 and 2) of what I am calling var. *americanum*. It is possible to take either of these as standing for *M. americanum*, and in 1935 Pennell chose to consider the narrowest-leaved plant, not here shown (possibly typical *M. lineare*) as primarily meant by Michaux. That may perhaps be so, but Michaux's "foliis lineari-lanceolatis; superiorum basi parce setaceo-dentata" is as good, if not better, for the common narrow-leaved plant with the middle and upper bracts sharply toothed at base as for the most northern extreme (*M. lineare*, var. *lineare* Beauverd), which was originally and correctly described "foliis linearibus, integerrimis" and again "Les feuilles sont . . . linéaires, . . . entières". At any rate, Beauverd in his monograph of the genus in 1916, had already made the choice from the three Michaux pieces; he selected, not the boreal and alpine plant with linear leaves and entire bracts, but the one which is common southward, with narrowly lanceolate leaves, the middle and upper bracts toothed, and he cited as illustrating it Britton & Brown, Ill. Fl. iii. fig. 3340 (1898). Beauverd having first made the decision as to which of Michaux's mixed material should stand as type of *M. americanum*, I follow him, especially since I am recognizing that plant as a reasonably good geographic variety.

Var. **pectinatum** (Pennell), stat. nov. *M. lineare pectinatum* (as subsp.) Pennell, l. c. 515 (1935).—Dry sandy pineland and oak scrub, eastern Massachusetts, Rhode Island and southeastern New York to Virginia: northern Indiana. Plate 736, fig. 1.

In eastern Virginia found in Princess Anne County: Cape Henry (various collectors).

Var. latifolium Barton, Compend. Fl. Phila. ii. 49 (1818); combination independently published by Beauverd, l. c. 474 (1916) and by Farwell in Am. Midl. Nat. xii. 72 (1930). *M. americanum*, var. *latifolium* Barton, Fl. Phila. Prodr. 64 (1815). *M. latifolium* Britton in Britton & Brown, Ill. Fl. iii. 188, fig. 3341 (1898), ascribed to Muhlenberg who gave no diagnosis. *M. lineare*, subsp. *latifolium* Soó in Fedde, Repert. Spec. Nov. xxiv. 189 (1927). *M. lineare latifolium* (as subsp.) Pennell, l. c. 512 (1935).—Dry or moist woods, southwestern Quebec and New York to southern New England, Long Island, Virginia, and on the upland to Georgia, less common than var. *americanum*. Plate 736, fig. 2.

In eastern Virginia known only from the Eastern Shore.

Plate 734 is of typical Melampyrum lineare: fig. 1, upper half of Desrousseaux's type, × 1, from photograph by *Cintract;* fig. 2, branching plant, × 1, from summit of Rumford Whitecap Mt., Rumford, Maine, *Pease*, no. 19,420; fig. 3, small unbranched plant, × 1, from no. 19,420; fig. 4, bracts and fruit, × 2, from no. 19,420.

Plate 735, var. americanum: fig. 1, portion of the larger of the three preserved Michaux specimens, × 1, transitional between typical M. lineare and var. americanum (note toothed bracts near center and lanceolate leaves); fig. 2, the fertile tip, × 1, in Herb. Michaux, apparent basis of Michaux description of M. americanum with leaves, the "superiorum basi parce setaceodentata"; fig. 3, summit of median axis in fruit, × 1, from Eel Lake, Yarmouth County, Nova Scotia, *Fernald, Bean & White*, no. 22,471. Figs. 1 and 2 from photograph by *Cintract*.

Plate 736, fig. 1, var. pectinatum: portion of isotype, × 1, from Toms River, Ocean County, New Jersey, *Pennell*, no. 6522. Fig. 2, var. latifolium: portion of main flowering axis, × 1, from Highlands, North Carolina, July 13, 1901, *T. G. Harbison*.

(*To be continued*)

Vol. 44, no. 526, including pages 341–408 and plates 717–724, was issued 17 October, 1942.

Photo. B. G. Schubert.

MELAMPYRUM LINEARE, var. AMERICANUM: FIGS. 1 and 3, × 1, FIG. 2, × 2; FIGS. 1 and 2, from Michaux's TYPE, after *Cintract*.

Photo. B. G. Schubert.

Melampyrum lineare, var. pectinatum: fig. 1, portion of Pennell's isotype, × 1. Var. latifolium: fig. 2, portion of flowering axis, × 1.

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Rhodora

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EUPATORIUM HYSSOPIFOLIUM: FIG. 1, foliage, × ½. Var. LACINIATUM: FIG. 2, foliage, × ½. Var. LINEARIFOLIUM: FIG. 3, foliage, × ½.

Photo. B. G. Schubert.

EUPATORIUM SALTUENSE: FIG. 1, TYPE, × ½; FIG. 2, involucre, × 4.
E. ANOMALUM: FIG. 3, foliage, × ½; FIG. 4, involucre, × 4.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 44. December, 1942. No. 528.

THE RELATIONSHIP OF LILIUM MICHIGANENSE

Edgar T. Wherry

In a recent article in this Journal[1] the characters of two east-American lilies were discussed, with the conclusion "that *L. michiganense* is not a valid species, and that all the plants included therein really belong to *L. superbum*." Since in his studies of the soil-reaction preferences of native plants the present writer has had no difficulty in distinguishing these two lilies, further discussion seems called for.

Of the 16 characters of possible diagnostic significance considered in the article cited, 12 may be dismissed as having been disposed of, there being either no recognizable differences at all, or such as do occur being of obvious environmental origin. The four which require further attention are: leaf-indument, curvature and coloration of perianth-segments, and anther-length.[2] To these should be added ribbing of perianth-segments. The discussion should moreover be broadened to include the related *L. canadense*.

Leaf-Indument. *Lilium canadense* and *L. michiganense* normally bear tiny spicules on the leaf-margins and on the dorsally projecting veins; only in rare individuals are these reduced to papillae on the veins. On the other hand, *L. superbum* has the margins and veins at most papillose, and often entirely smooth.

[1] Hull in Rhodora **44**: 220. 1942.

[2] Some years ago Mills, Proc. Iowa Acad. Sci. **31**: 265. 1926, pointed out the distinctness in these respects of *L. michiganense* as it occurs in Iowa. In the present article his observations are fully confirmed, but considerable additional data are presented.

Curvature of Perianth-Segments. There seems to be general agreement that the curvature in *L. michiganense* is about as strong as in *L. superbum*.

Coloration. The underlying pigment in all three is yellow. *L. canadense* occasionally has this suffused by red, the extreme being known as f. *rubrum* Britton. In *L. michiganense* and *L. superbum* the red coloring is normally abundant, vanishing only in rare mutants.

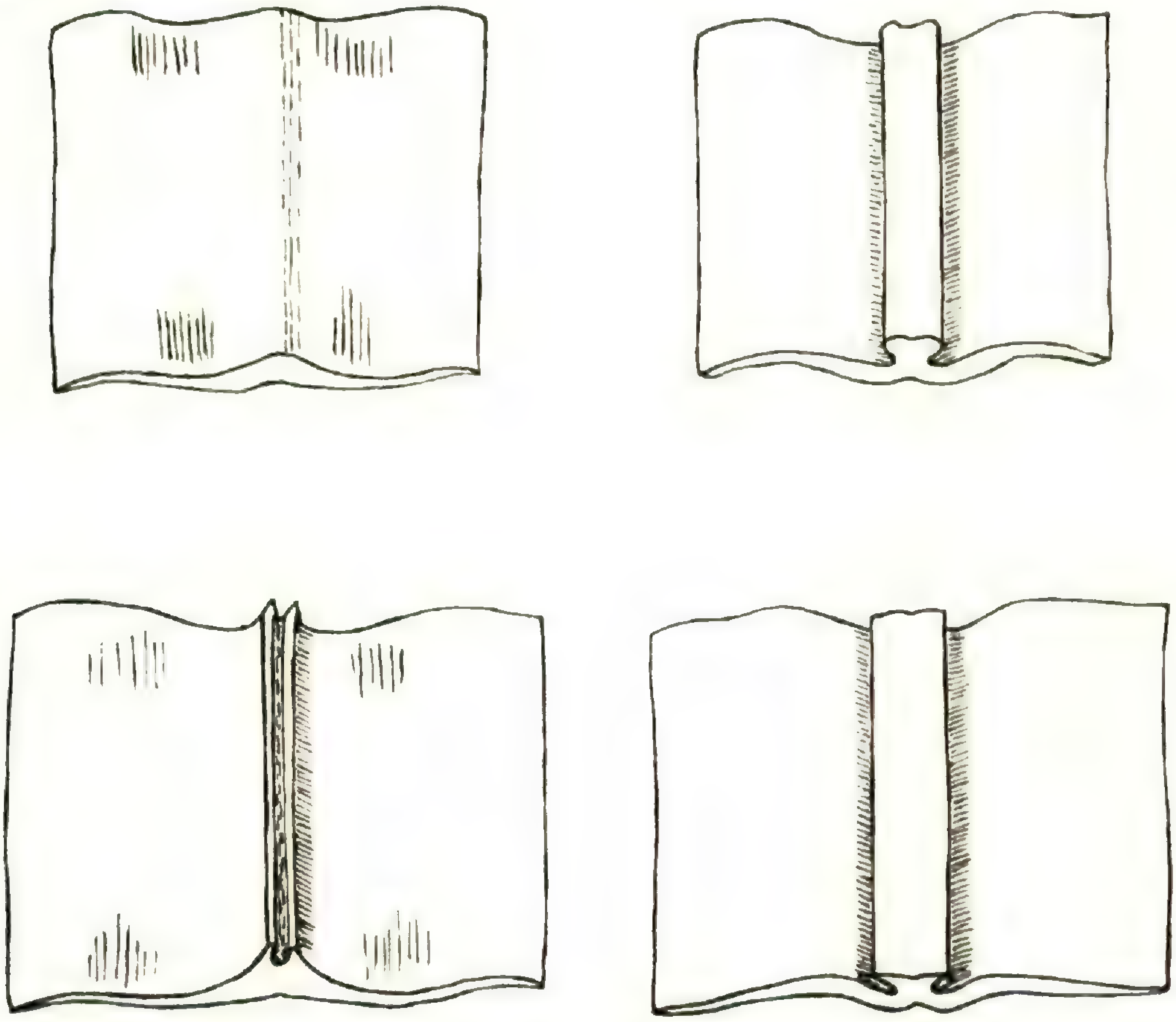


Fig. 1. Sections of sepals and petals × 2: upper, *L. canadense* and *L. michiganense;* lower, *L. superbum.*

At the base of the perianth-segments there is a translucent green zone corresponding to the glandular area the features of which are useful in classifying some other *Liliaceae*. In *L. canadense* and *L. michiganense* this green area is mostly less than 10 mm. long, has rather indistinct margins, and can not be seen when the flowers are viewed face-on. In *L. superbum* it is 10 to 15 mm. long with sharp boundaries, and can easily be seen in the flower-center.

Anther-length. At mid-anthesis the range is 6 to 11 mm. in *L. canadense* and *L. michiganense*, and 12 to 20 mm. in *L. superbum*. While aberrant individuals with decidedly over-size or under-size anthers are occasional, the frequency-plots are normal, with maxima at 8.5 and 16 mm. respectively.

Ribbing of Perianth-Segments. The usefulness of this character does not seem to have been pointed out heretofore. In *L. canadense* the midrib of the sepals is an inconspicuous low rounded ridge; that of the petals is either rounded on the sides or at most bears very narrow horizontal ridges. In *L. superbum* the midrib of the sepals is elevated and bears a pair of erect sharp-edged ridges; that of the petals bears prominent horizontal ridges on its sides. The ribs of *L. michiganense* are of the *canadense* type. This feature is illustrated by the accompanying sketches kindly made by Mr. Hugh E. Stone.

Soil-Reaction Preference. Circumneutral to subacid for *L. canadense* and *L. michiganense;* subacid to mediacid for *L. superbum.*

The following synoptical key will serve to separate normal individuals of these three lilies. The intermediate *L. michiganense* surely does not "belong to *L. superbum*," lying instead close to *L. canadense*. For the purposes of the ecologist, the phytogeographer, and the horticulturist all three should be maintained as distinct (though not necessarily in species status).

Key to Three Entities in the Genus Lilium

Leaves bearing spicules on margins and often on veins dorsally; sepal-midrib low, rounded, inconspicuous; petal-midrib laterally rounded or barely ridged; basal green zone of perianth-segments 5 to 10 mm. long; anthers 6 to 11 mm. long; anthesis early aestival; soil-reaction circumneutral to subacid.

  Recurving of perianth-segments moderate; red pigment varying widely in intensity; range wide.............. *L. canadense.*

  Recurving of perianth-segments strong; red pigment usually copious; range midland................ *L. michiganense.*

Leaves bearing papillae or glabrous on margins and veins; sepal-midrib elevated, bearing two erect sharp ridges; petal-midrib laterally extended into prominent ridges; perianth-segments strongly recurved; red pigment usually copious; basal green zone 10 to 15 mm. long; anthers 12 to 20 mm. long; anthesis late-aestival; soil-reaction subacid to mediacid; range southern and eastern........................ *L. superbum.*

The above discussion is based not only on herbarium work but also on field study of over a hundred plants, in their native habi-

tats and in the extensive garden of Mrs. J. Norman Henry at Gladwyne, Pennsylvania. My thanks are due to Mrs. Henry for pointing out the practical usefulness of the criteria here emphasized.

UNIVERSITY OF PENNSYLVANIA.

EPIPACTIS LATIFOLIA IN NEW HAMPSHIRE.—In the late summer of 1942, the writer was invited to accompany Mr. and Mrs. C. A. Weatherby on a botanical collecting trip to New Hampshire and Vermont. On August 23rd the party was exploring a wooded roadside a short distance east of the Connecticut River, in the town of Plainfield, when an orchid was found which at some distance had the appearance of a *Habenaria.* Approaching near enough to see it clearly, Mr. Weatherby at once identified it as *Epipactis latifolia* (L.) All. (*Serapias Helleborine* of Gray's Manual.) Careful search revealed no more than the single individual first seen. It was growing in shaded, fairly rich soil, near the base of a small bank which sloped down from the highway. Contrary to the usual coloration of the flowers as given in descriptions, these were nearly white instead of greenish and showed little madder-purple suffusion.

According to authorities this orchid was probably introduced from Europe in early times, and in the course of years has appeared in eastern Canada, Massachusetts, Pennsylvania and New York. Mr. Charles Schweinfurth has lately reported it also from Missouri and Montana. Neither Mr. Schweinfurth nor Dr. Correll knows of any previous record of the plant for New Hampshire. Mr. Weatherby states: "the species has become established in considerable quantity near Swanton, Vermont, and Pittsfield, Massachusetts." It was found in Hartland, Vermont, just across the river from Plainfield, and also near the river, in 1925 by Mr. E. H. Hazen. This places the species close to the Plainfield station, but its actual occurrence within the boundaries of New Hampshire seems worth recording. It is probably safe to assume that, except for a single collection on trap hills in West Hartford, Connecticut (Mrs. S. M. Monks, 1931), the New Hampshire station is the farthest east so far in New England.

The facts that the species is known in considerable quantity in New England only in the western part, that at Plainfield it grows in alluvium not far from such calcicolous species as *Lobelia Kalmii* and *Parnassia glauca* (*P. caroliniana* of manuals), and that the Hartford trap produces a somewhat basic soil, suggest that the *Epipactis* prefers limy soil and that its distribution may be controlled by this preference. If so, the New Hampshire locality may remain on its easternmost limits.—ALAN W. UPHAM, East Woodstock, Connecticut.

THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. FERNALD

(*Continued from page 452*)

*DIODIA VIRGINIANA L., var. **attenuata,** var. nov., planta gracillima; foliis anguste lanceolatis membranaceis basi apiceque valde attenuatis; fructibus subcylindricis 2.5–3.5 mm. diametro; calycis lobis linearibus.—VIRGINIA: open muddy and sandy borders of pools, alluvial bottomlands of Three Creek, Drewryville, Southampton County, September 14, 1941, *Fernald & Long*, no. 13,765 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

The common and typical *Diodia virginiana* is relatively coarse, with the thick lanceolate to narrowly oblong leaves sessile and only slightly tapering at tip; its fruits are ellipsoid, 3.5–5 mm. in diameter, and crowned by lanceolate calyx-lobes. Var. *attenuata* is slender, relatively weak, with thin or membranaceous narrowly lanceolate leaves attenuate to petiolar bases and to prolonged tips; the slender fruits only 2.5–3.5 mm. broad and crowned by slenderly linear calyx-lobes. It dominates large areas of open muddy and sandy depressions on the bottomlands of Three Creek, where during the summer and autumn of 1940 it was not subject to inundation; nor is it the immediate result of shading, since the open areas of these bottoms are no more shaded than are many other areas where the broader-leaved and thicker-fruited plant abounds. See p. 367.

D. VIRGINIANA, forma **hirsuta** (Pursh), stat. nov. *D. hirsuta* Pursh, Fl. i. 106 (1814). *D. virginiana*, γ. *hirsuta* (Pursh) Torr. & Gray, Fl. ii. 29 (1841).—With no definite range and likely to

occur throughout the range of the smoother typical *D. virginiana*, the hirsute plants seem to be a form rather than a true geographic variety.

Viburnum Rafinesquianum Schultes. Dinwiddie County: a characteristic undershrub in open argillaceous low woods just east of McKenney, nos. 14,024 and 14,421; our first station on the Coastal Plain, the low woodlands occupying a characteristic intrusion of Coastal Plain back into the Piedmont. See p. 373.

*Campanula americana L., forma **tubuliflora,** f. nov., corollis cylindrico-tubuliformibus ad apicem angustatis clausis rare stylo exserto.—Virginia: seeping calcareous wooded bluffs by James River, west of old Fort Boykin, Isle of Wight County, September 5, 1941, *Fernald & Long*, no. 13,772 (type in Herb. Gray.; isotype in Herb. Phil. Acad.).—A remarkable aberration, strikingly contradicting the supposed generic character (the rotate corolla) upon which some botanists maintain *Campanula americana* as a separate genus, *Campanulastrum* Small. See p. 362.

Lobelia elongata Small. Norfolk County: fresh reed-marsh and swale along Northwest River near Northwest (the type-area), nos. 14,028 and 14,029, frequently with inflorescences virgate-forking. See p. 369.

Dipsacus sylvestris L. Isle of Wight County: disturbed soil by James River, below old Fort Boykin, nos. 13,170 and 13,768; the only time we have noted it in Tidewater Virginia.

*Elephantopus carolinianus Willd., forma **vestitus,** f. nov., caule superne ramibusque dense cinereo-tomentulosis hirsutisque, pilis patentibus.—Virginia: low woods, Adams Swamp, south of Baines Hill School, Nansemond County, June 20, 1941 and September 12, 1941, *Fernald & Long*, nos. 13,172 and 13,780 (type in Herb. Gray.; isotype in Herb. Phil. Acad.). See p. 367.

Typical and common *Elephantopus carolinianus* has only the lower internodes with divergent pubescence, the upper ones and the branches merely with somewhat scattered appressed strigae. Forma *vestitus* is cinereous with short and close pubescence to the summit, the lower and middle internodes heavily tomentulose, the upper ones with close tomentulose pubescence mixed with spreading hairs. Some other collections from Nansemond County are transitional.

Notes on Eupatorium hyssopifolium (Plate 737).—*Eupatorium hyssopifolium* L. Sp. Pl. ii. 836 (1753) was clearly described "foliis lanceolato-linearibus trinerviis integerrimis" and two early plates cited: one of *Eupatorium virginianum, folio angusto, floribus albis* of Dillenius (1732); the other of *Eupatoria*

Photo. B. G. Schubert.

EUPATORIUM RUGOSUM, var. CHLOROLEPIS: FIG. 1, foliage, × 1; FIGS. 2–4, heads and involucre, × 4; all from TYPE.

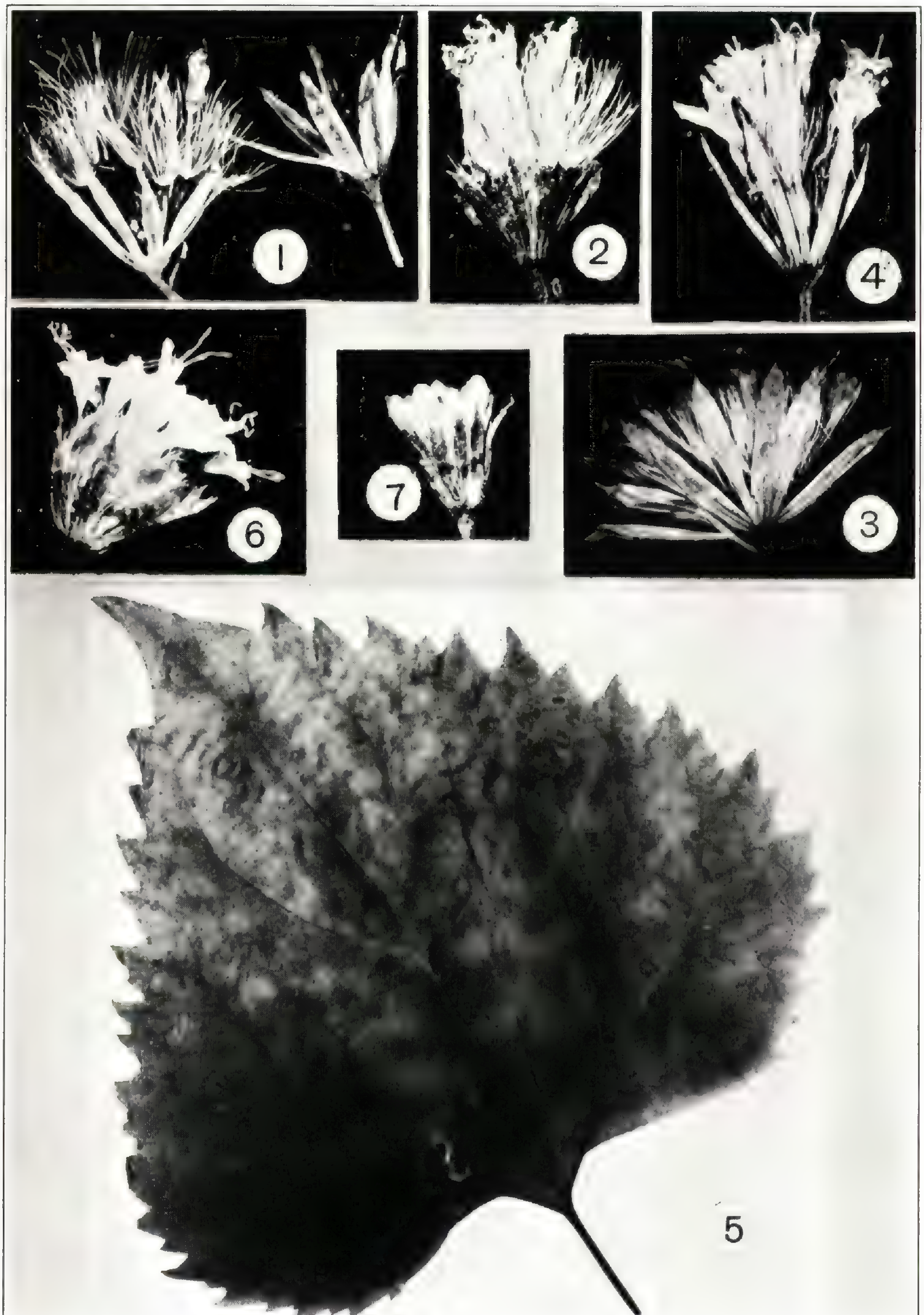


Photo. B. G. Schubert.

Eupatorium rugosum: fig. 1, head and involucre. Var. angustifolium: fig. 2, head. Var. roanense: fig. 3, head. Forma villicaule: fig. 4, head. All × 4. E. Luciae-Brauniae: fig. 5, leaf, × 1; figs. 6 and 7, flowering and budded head, × 4; all from type.

hirsuta, hyssopi foliorum aemula, virginiana of Plukenet (1691), from which Linnaeus obviously drew the name. The figure of Plukenet and the plate of Dillenius are unequivocal. They are of a plant of eastern Virginia (FIG. 1) thence north somewhat locally to southern Rhode Island and south to Alabama, with the lower primary leaves narrowly lanceolate or oblanceolate and entire or slightly toothed, the middle and upper ones entire, the principal ones 5–10 mm. broad. It occurs in moderately dry to damp soils.

This plant passes insensibly into one (FIG. 3), usually much commoner, with all the leaves narrowly linear to linear-oblanceolate, often revolute, mostly quite entire and ranging from 0.5–5 mm. broad, occurring generally north on dry sands and in open pinelands to southeastern Massachusetts, and south to Georgia. This is *E. linearifolium* Walter, Fl. Carol. 199 (1788), clearly described "foliis linearibus integris subverticillatis, calycibus 3 ad 5-floris".

In the other direction typical *Eupatorium hyssopifolium* passes to a plant with all or nearly all the primary leaves serrate to almost laciniate (FIG. 2). The principal primary leaves are lanceolate or linear-lanceolate and 5–17 mm. broad. It occurs in dry to wet soil from Pennsylvania to Kentucky, south to Florida, Alabama and Louisiana. In its most extreme development (with prolonged teeth) it is *E. hyssopifolium*, var. *laciniatum* Gray, Syn. Fl. N. Am. i^2. 98 (1884). The plants with somewhat lower and shorter teeth are *E. Torreyanum* Short in Transylv. Journ. Med. n. 32, viii. 575 (1836).

These three plants, strikingly different in their extremes, so clearly merge that it is most difficult to sort them into exclusive piles. In involucre, corolla and achene they seem to be inseparable, and they all have the consistent habital character, the development of crowded and suppressed branches, forming fascicles in the axils of all but the lowest leaves. Our representation from southeastern Virginia is as follows.

E. HYSSOPIFOLIUM L. (typical). NORTHAMPTON COUNTY: Capeville, no. 5497; Eastville, no. 5496; Bell's Haven, *Fogg*, no. 9728. PRINCESS ANNE COUNTY: Cape Henry, *Killip*, no. 6680; Virginia Beach, nos. 2948, 5064 and 5070; Rosemont, no. 5065; Macon Corners, no. 2949. NORFOLK COUNTY: Great Dismal Swamp, north of Wallaceton, no. 13,795. ISLE OF WIGHT

COUNTY: Bailey's Beach (McKimmie's Wharf), near Rushmere, no. 12,845; west of old Fort Boykin, no. 13,794. SURRY COUNTY: Claremont, no. 12,844. SUSSEX COUNTY: southwest of Lambs, no. 7644. NANSEMOND COUNTY: Kilby, no. 5066. SOUTHAMPTON COUNTY: southwest of Applewhite's Church, no. 11,450.

*Var. LACINIATUM Gray. ELIZABETH CITY COUNTY: west of Hampton, no. 5071. PRINCESS ANNE COUNTY: Dam Neck, no. 4706. NORFOLK COUNTY: Lake Drummond, Great Dismal Swamp, west of Wallaceton, nos. 13,476 and 13,793. ISLE OF WIGHT COUNTY: Cat Pond, south of Benns Church, no. 7642. SOUTHAMPTON COUNTY: moist sandy and peaty shore of Whitefield's Millpond, no. 14,429. PRINCE GEORGE COUNTY: south of Upper Brandon, no. 9165.—These are identified with the TYPE of var. *laciniatum*, which I am designating as the plant of Bedford County, Virginia, September 10, 1871, *A. H. Curtiss*, which, obviously, was the chief basis of Gray's variety. See p. 366.

*Var. **linearifolium** (Walt.), stat. nov. *E. linearifolium* Walt. Fl. Carol. 199 (1788). NORTHAMPTON COUNTY: Eastville, no. 5495. JAMES CITY COUNTY: 1 mile west of Williamsburg, *Grimes*, no. 3190. PRINCESS ANNE COUNTY: Virginia Beach, no. 5067; Rosemont, no. 5068. NORFOLK COUNTY: Northwest, *Heller*, no. 1239. ISLE OF WIGHT COUNTY: south of Lee's Mill, no. 12,840. SURRY COUNTY: Cobham Bay, northwest of Chippokes, no. 12,841; Claremont, no. 12,842.

PLATE 737 is of foliage of the three varieties of EUPATORIUM HYSSOPIFOLIUM, all × ½: FIG. 1, typical E. HYSSOPIFOLIUM from north of Wallaceton, Virginia, *Fernald & Long*, no. 13,795; FIG. 2 of the TYPE of var. LACINIATUM; FIG. 3 of var. LINEARIFOLIUM from Rosemont, Virginia, *Fernald & Long*, no. 5068.

As noted, *Eupatorium hyssopifolium* and its confluent varieties have fascicles of suppressed branches in the axils of all but the lowest leaves. Another plant of southeastern Virginia (PLATE 738, FIGS. 1 and 2), there found in rich, mostly calcareous, woods and thickets, might be considered a very extreme development of *Eupatorium hyssopifolium*, much larger and with broader leaves than in *E. hyssopifolium*, var. *laciniatum.* This calcicolous and broader-leaved plant, however, usually does not develop axillary fascicles, or the axillary branches are few and not fascicled. Instead, it has the habit of *E. altissimum* or of very large *E. leucolepis,* with the involucre of *E. hyssopifolium.* I can relate it closely only to *E. anomalum* Nash, described from Florida but now known from southeastern North Carolina.[1] It so far departs, however, from *E. anomalum* that I am calling it

[1] Here I place the material distributed without specific identification from pineland at Fort Fisher on the Lower Cape Fear Peninsula, New Hanover County, North Carolina, *Godfrey*, no. 6193. It is a close match for Nash's type.

*E. **saltuense,** sp. nov. (TAB. 738, FIG. 1 et 2), caule erecto subtereto 0.9–1.4 m. alto superne minutissime hirtello; foliis caulinis 12–14-jugis patentibus vel laxe adscendentibus glabris vel subtus minute hirtellis; primariis lanceolatis acuminato-attenuatis 6.5–11 cm. longis 1.3–2.5 cm. latis serratis, dentibus plerumque 12–15-jugis, basi angustatis sessilibus vel imis breviter petiolatis; corymbo 1.8–3 dm. latis; involucris 6–7 mm. altis, phyllaribus 3-seriatis puberulis obtusis, externis ovato-oblongis, internis oblongis apice scariosis; acheneis 3 mm. longis acute angulatis.—Rich woods, thickets and clearings, southeastern VIRGINIA: thicket back of sand-beach of Cobham Bay, James River, northwest of Chippokes, Surry County, August 25, 1940, *Fernald & Long*, no. 12,846 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); rich alluvial woods and thickets back of sand-beach of James River, below Sunken Meadow Beach, Surry County, August 23, 1938, *Fernald & Long*, no. 9166; rich calcareous wooded ravine west of Claremont, Surry County, August 23, 1940, *Fernald & Long*, no. 12,847; open pine and oak woods about 3 miles southwest of Waverly, Sussex County, October 20, 1936, *Fernald & Long*, no. 6880; dry sandy woods, thickets and clearings north of Moore's Mill, Sussex County, July 19, 1936, *Fernald & Long*, no. 6413; wooded banks of Appomattox River, Petersburg, Dinwiddie County, September 24, 1939, *Fernald & Long*, no. 11,451; dry woods about 5 miles east of Burgess Station, Dinwiddie County, August 26, 1939, *Fernald & Long*, no. 11,166. See p. 366.

Differing from *Eupatorium hyssopifolium* L. (pl. 737, FIG. 1), its var. *laciniatum* Gray (FIG. 2) and var. *linearifolium* (Walt.) Fernald (FIG. 3) in its broad leaves without crowded axillary fascicles, at most producing few short branches in some of the upper axils. In involucres, flowers and fruits it is very similar to the others; but the habital difference seems to separate it quite definitely from *E. hyssopifolium*. Nearly related to *E. anomalum* Nash, but that more southern species (FIGS. 3 and 4) has relatively short and broad leaves and more tapering and narrower phyllaries, and its heads are on definitely bracted pedicels.

In PLATE 738, FIG. 1 is the TYPE of EUPATORIUM SALTUENSE, × ½; FIG. 2, an involucre, × 4. FIGS. 3 and 4 are of E. ANOMALUM from near Lloyds, Florida, *A. H. Curtiss*, no. 6902; FIG. 3, larger cauline leaves, × ½; FIG. 4, an involucre, × 4.

*E. RECURVANS Small. Extended north from Georgia and southeastern South Carolina. NORFOLK COUNTY: damp old clearings and thickets, eastern side of Great Dismal Swamp,

north of Wallaceton, no. 13,796; wet sandy and peaty shore near entrance to the Feeder Ditch, Lake Drummond, Great Dismal Swamp, no. 13,797; similar habitat, near entrance to Portsmouth Ditch, Lake Drummond, nos. 13,798 and 13,799. Surry County: open clearing, Hog Island, no. 12,843 (leaves not recurved, but with shape and size as well as with the involucre of *E. recurvans*). See p. 366.

E. tortifolium Chapm. Range extended westward into Southampton County: dry sandy pine and oak woods 6 to 7 miles south of Franklin, no. 8867.

E. sessilifolium L., var. Vaseyi (Porter) Fern. & Grisc. Range extended to Surry County: woods and thickets back of sand-beach of James River, Claremont, no. 13,792.

E. rugosum Houtt. (*E. urticaefolium* Reichard). To the few recorded stations in the southeastern tidewater counties add the following. Sussex County: rich woods, Moore's Mill, no. 7647; dry woods by Nottoway River, Green Church Bridge, northwest of Owen's Store, no. 14,032. Greensville County: rich wooded slope just above the "fall-line" by Three Creek, northwest of Emporia, no. 14,031. Plate 740, fig. 1.

*E. rugosum Houtt., var. **roanense** (Small), stat. nov. *E. roanense* (as "*roanensis*") Small, Man. Se. Fl. 1326 (1933). Craig County: Potts Mts., alt. 910 m. *Steele & Steele*, no. 118.—Although Small described his *E. roanense* only from Roan Mt. in western North Carolina and eastern Tennessee, with "bracts somewhat spatulate" (see plate 740, fig. 3), this characteristic extreme follows the mountains from Potts Mountains (separating Craig County, Virginia, from Monroe County, West Virginia) to northwestern Georgia (*Ravenel* in Gray Herb.).

*E. rugosum Houtt., var. **chlorolepis,** var. nov. (tab. 739), foliis primariis late ovatis acuminatis basi rotundatis vel subcordatis utrinque strigoso-setulosis 5–10 cm. longis 3–6.5 cm. latis; involucris 4–5.5 mm. longis, phyllaribus herbaceis viridiscentibus oblongis vel late linearibus valde nervosis.—Surry County, Virginia: woods and thickets back of sand-beach of James River, and rich calcareous wooded ravines along the James, Claremont, September 7, 1941, *Fernald & Long*, nos. 13,784 and 13,785, October 10, 1941, *Fernald & Long*, no. 14,034 (type in Herb. Gray., isotype in Herb. Phil. Acad.). See pp. 363 and 371. In plate 739 all figures are from the type, fig. 1, summit of stem, × 1, figs. 2–4, heads and involucre × 4.

Characterized by its broad and herbaceous phyllaries (figs. 2–4), much broader than the linear-attenuate scarious ones (pl. 740, fig. 1) of typical *Eupatorium rugosum*. Although the wide-spread *E. rugosum* may have the leaves as small as in var. *chlorolepis*, they are usually much larger (up to 1.8 dm. long and

1.1 dm. broad), generally smoother and only rarely subcordate. The broad and strongly costate phyllaries, green and herbaceous except for the short scarious tip, at once mark the variety. In a region (the very rich calcareous slopes to the James) which is famous for the great size of foliage of most species we should expect *E. rugosum* to have large leaves, for, in much less favorable spots in the southeastern counties the thin and smooth noncordate leaves of typical *E. rugosum* are 8–15 cm. long and up to 10 cm. broad. The involucre of var. *chlorolepis* suggests that (FIG. 2) of the southwestern var. *angustatum* (Gray) Blake (Arkansas, Louisiana and Texas), but the phyllaries are more corrugated and the ovate leaves rounded to subcordate at base, whereas in var. *angustatum* they are very narrowly ovate to broadly lanceolate, with strongly tapering bases. In width of phyllaries var. *chlorolepis* is comparable with var. *roanense* (noted above); but that characteristic variety of the Blue Ridge or of the Alleghenies, from the borders of Virginia and West Virginia to Georgia and Tennessee, has very full heads, with the phyllaries (FIG. 3) dilated upward and with broadly scarious margins.

The plant with villous stems and petioles described by me as *Eupatorium urticaefolium*, var. *villicaule* is only a trivial form,[1] rather than a true geographic variety. Its involucre (FIG. 4) is that of typical *E. rugosum* and its foliage is characteristic of typical *E. rugosum*. FIG. 4 is from the type.

Of close affinity to *Eupatorium rugosum* is the very local species of Whitley County, Kentucky, *E. Luciae-Brauniae*[2]; but the cordate-deltoid leaves (FIG. 5) and the tiny involucres (FIGS. 6 and 7) with caudate-tipped phyllaries mark that little known plant.

In PLATE 740 the involucres and heads are all × 4, the leaf × 1. FIG. 1 shows a fruiting head and a separated involucre of EUPATORIUM RUGOSUM from northwest of Emporia, *Fernald & Long*, no. 14,031; FIG. 2, a flowering head from the TYPE of var. ANGUSTATUM; FIG. 3, a flowering head of var. ROANENSE from Highlands, North Carolina, *Harbison*, no. 1105; FIG. 4, from TYPE of forma VILLICAULE.

FIGS. 5–7 are from the TYPE of E. LUCIAE-BRAUNIAE, a characteristic leaf, a flowering head (FIG. 6) and a younger head (FIG. 7).

[1] EUPATORIUM RUGOSUM Houtt., forma **villicaule** (Fernald), stat. nov. *E. urticaefolium*. var. *villicaule* Fernald in RHODORA, x. 87 (1908). *E. rugosum*, var. *villicaule* (Fernald) Blake in RHODORA, xliii. 558 (1941).

[2] E. **Luciae-Brauniae**, nom. nov. *E. deltoides* E. L. Braun in RHODORA, xlii. 50 (1940), not *E. deltoideum* Jacq. (1798) nor Poepp. ex Spreng. (1826).

Carphephorus bellidifolius (Michx.) T. & G. Two range extensions northward. Isle of Wight County: dry sandy woods northwest of Raynor, no. 13,471. Southampton County: dry sandy oak woods southwest of Applewhite's Church, no. 13,782.

Chrysopsis graminifolia and Allies in Virginia and the Carolinas (Plates 741–744).—The characteristic series of plants of sands of the Coastal Plain and sands or silicious rocks of adjacent provinces, which, in the aggregate, passes as *Chrysopsis graminifolia* (Michx.) Ell., is very complex. By early American authors treated as a single variable species, it seems to consist of a considerable number of localized trends, comparable with those in *Aster, Solidago* and *Antennaria*. By Small it was treated in his Flora of the Southeastern United States, 1181 and 1182 (1903) as 9 species. Some of the latter, *C. flexuosa* Nash, *C. latifolia* (Fernald) Small, *C. Ruthii* Small, *C. oligantha* Chapm., *C. microcephala* Small and, perhaps, *C. Tracyi* Small, are sufficiently definite as to stand as local species. There are apparently others to be differentiated in the most southern States. These I am not attempting to deal with; but the splendid series from eastern North and South Carolina assembled by Mr. Robert K. Godfrey and the recent series from eastern Virginia gives evidence that, whereas the elongate basal leaves are essentially alike in all these plants, there are very real differences in habit and involucres.

Although in 1903 and again in 1913 (his Fl. ed. 2) Small considered these plants of the *Chrysopsis graminifolia* series to be members of *Chrysopsis*, in his Manual (1933) he removed them to *Pityopsis* and divided this hardly worth-while genus into three series of species, two of which, his "II. *Graminifoliae*" and "III. *Asperae*", are well represented in Virginia and the Carolinas. *Pityopsis*, series *Graminifoliae* he characterized, "Peduncles, branches and stem woolly-tomentose", the *Asperae* having "Peduncles, branches, and sometimes the stem, glandular". Under the *Asperae* the only species in Small's treatment which concerns us is *P. aspera* (Shuttleworth) Small, with "outer bracts of the involucre . . . glandular". Desperately floundering in the complexities of the group and trying to match the plant of eastern Virginia with relatively short and glabrate or glabrous but stipitate-glandular involucre, in 1937 (Rhodora,

xxxix. 455) I called it *C. graminifolia*, var. *aspera* (Shuttleworth) Gray, in contradistinction to the plants with glandless and pilose or lanate involucres which, following Small, I then called *C. graminifolia*.

Shuttleworth seems never to have published *Chrysopsis aspera*. The binomial first appeared as the synonymic basis for *C. graminifolia*, var. *aspera* Gray, Syn. Fl. N. Am. i². 121 (1884), Gray defining an all-inclusive *C. graminifolia* (Michx.) Ell. as "silvery sericeous", with "bracts [phyllaries] many-ranked, glabrate, sometimes granulose-glandular on back; peduncles when glabrate, often hirtellous-glandular", and of this "silvery-sericeous" plant he proposed

> "**Var. áspera** (*C. aspera*, Shuttlew. in distrib. coll. Rugel), a glabrate rigid and polycephalous state, near St. Marks, Florida (probably on the very coast), the stem and leaves sparsely glandular-hispidulous."

Just what Gray had as var. *aspera* I am unable to say, no plant so named by him being now in the Gray Herbarium, although a *Rugel* specimen from Florida, received since Gray's death, sufficiently matches his description. It is apparently a trivial state of the plant with copiously glandular involucre. The specific or, with Small, serial character "Peduncles . . . glandular", as opposed to "Peduncles . . . woolly-tomentose", too often breaks: for instance, a single specimen of *C. nervosa* (Willd.) Fern. (*C. argentea* (Pers.) Ell.) from Northampton County, Virginia (*Fernald, Long & Fogg*, no. 5503), has 2 large heads, with glandless involucres, but one head is on a silky-pilose almost glandless peduncle, the other with the peduncle copiously stipitate-glandular. Most commonly, however, when stipitate glands abound on the peduncles they are equally abundant on the involucres; but some plants, in general quite like ordinary small-headed *C. aspera*, have the involucres with no stipitate glands, or a few only on the lowest phyllaries.

Incidentally, if, before taking up *Chrysopsis aspera* as a species, Small had consulted the original description of *Inula graminifolia* Michx. Fl. Bor.-Am. ii. 122 (1803), the basis of *C. graminifolia* (Michx.) Ell. Sk. ii. 334 (1824), he would have found that it was clearly described "calycibus turbinatis; squamis numerosis, acutissimis, superne glandulosis . . . *Hab.* a Carolina ad Floridam, frequens". Small defines *C. aspera* with "outer

bracts of the involucre lanceolate, glandular". The difference is not evident. Persoon, working with Michaux's collections in 1806, maintained *Inula graminifolia*, "argenteo-sericea, . . . fol. lanceolato-linearib. nervosis, . . . squamis acutissimis medio glandulosis . . . Cal. parvuli Conyzae, carina serrato-glandulosa", and, immediately following, described as a new species, presumably found in Michaux's material,

> "*Inula argentea*, sericea, fol. lanceolatis trinerviis erectis flexuosis, corymb. subcomposito stricto. Hab. in Pennsylvania. Color pl. argenteo-virens. Fol. lanceolato-acuminata, cauli subappressa. Antecedenti colore et foliis similis, sed flor. multo majores, squamae calycin applantae, pubescentes".—Pers. Syn. ii. 462 (1806).

Inula argentea is, evidently, the common, usually nonglandular plant (PLATE 743, FIG. 3 and PL. 744, FIG. 3) which follows the sands northward to Delaware; and when Nuttall placed *I. graminifolia* Michx. and *I. argentea* Pers. in his subgenus *Chrysopsis* in his Gen. ii. 151 (1818), he explicitly defined *I. graminifolia* with "calix . . . glandularly pubescent" while *I. argentea* had "calix . . . pubescent, not glandular". Nuttall apparently erred, however, in placing *Erigeron nervosum* Willd. under *I. graminifolia* and there is apparently no justification for his citing the plant with glandular involucre from Delaware, where *I. argentea* alone is known. Nuttall gave for *I. graminifolia* (glandular involucre) the range "Delaware to Florida", for the glandless *I. argentea* "Virginia to Florida".

As to *Erigeron nervosum* Willd. Sp. iii³. 1953 (1803), with "*Habitat in* America *boreali*", his description was rather detailed:

> "*5. Erigeron *nervosum*. W.
>
> E. foliis lineari-lanceolatis integerrimis sericeis, nervosis, floribus paniculatis. W.
>
> Nerviges Berusungskraut. W.
>
> *Habitat in* America *boreali.* ♃ (v. s.).
>
> Caulis *erectus simplex albo-tomentosus.* Folia *alterna inferiora quadripollicaria, summa semipollicaria et breviora, stricta rigida, lineari-lanceolata acuta integerrima . . . nervosa viridia, subtus pilis sericeis adspersis albidis obsita.* Panicula *terminalibus simplex, pedunculis tomentosis.* Calyx *imbricatus, squamis oblongis.* Corolla *non vidi.* Pappus *rufescens pilosus.* W."[1]

Willdenow said nothing about glands on the involucre. His

[1] This unusually full description was characterized by E. L. Greene in Erythea, ii. 93 (1894) as "worse than a *nomen nudum*, and that specific name should therefore be allowed to remain unemployed."

Erigeron nervosum was, with scarcely a doubt, the commonest coastwise species of eastern America, *Chrysopsis argentea* (Pers.) Ell. (PL. 743, FIG. 3, and 744, FIG. 3).

As pointed out to me by Mr. Robert K. Godfrey, when he was tentatively working over his Carolina collections, *Chrysopsis microcephala* lacks the prolonged and horizontal stolons which are found in carefully collected *C. nervosa.* This character seems to be a fundamental one, just as it is in *Antennaria.* One series is cespitose or subcespitose, with the erect new leafy basal offshoots close to the flowering stem or merely on very short and promptly assurgent offshoots; the other series, although sometimes with approximate erect leafy tufts, generally produces prolonged and flagelliform stolons (see PL. 744, FIG. 1), these eventually terminated by the characteristic basal rosettes from which, the following season, new flowering stems arise. In carefully collected material this difference in the vegetative habit is striking; in merely "grabbed" (not "grubbed") specimens the inconclusive identifications have to be by matching specimens. The character, glandular or nonglandular involucre, etc., is, it would seem, less fundamental. True *C. graminifolia* (*C. aspera*) PL. 742, FIG. 3, with abundant stipitate glands on the involucre, passes into a state habitally quite like it but with the glands nearly obsolete; and, under the silky tomentum, the involucres of *C. nervosa* may sometimes show abundant but minute viscid trichomes or glands.

Returning to the division of the series on habit, the specimens in the Gray Herbarium give the following results. To the series with cespitose or subcespitose habit belong *C. graminifolia* (*aspera*), PL. 742, FIG. 3, *C. microcephala*, PL. 741, FIG. 3, *C. Correllii* (see below), PL. 741, FIGS. 1 and 2, and *C. latifolia;* to the series with flagelliform stolons *C. nervosa* (*C. graminifolia* of authors and *C. argentea*), PL. 743, FIG. 3 and 744, FIG. 3, *C. Tracyi* (too near the last), *C. oligantha* and *C. adenolepis* (see below), PL. 742, FIGS. 1 and 2. *C. Ruthii* and *C. flexuosa*, with subequal and loosely spreading cauline leaves, are not habitally like the others. Within these two series there are parallel tendencies. The species with involucres glandular but otherwise glabrous have the leaves of the peduncles few and scattered; those with the involucres pilose to silky-lanate have the equally pubescent

leaves of the peduncles very numerous and imbricated, so that they and the lowest phyllaries seem confluent.

Upon these characters I am grouping the species of the *graminifolia* series in Virginia and the Carolinas as follows, it being clearly understood that, when types of Michaux, Persoon, Willdenow and some others are available again, the applications of some names may necessarily change.

a. Plants cespitose or tufted, the basal offsets erect or at most short and promptly assurgent stolons. . . . *b.*
b. Involucre glabrous or essentially so at base, 6–10 mm. high (to tips of inner phyllaries); phyllaries and peduncles stipitate-glandular or glutinous, the phyllaries not conspicuously merging into the few scattered leaves of the peduncle. . . . . 1. *C. graminifolia.*
b. Involucre silky-lanate at least at base, the outer phyllaries and the abundant and imbricated upper leaves of the peduncles intergrading.
Involucre (to tips of inner phyllaries) 5–8 mm. long, at first mostly heavily lanate at base; principal phyllaries oblong-lanceolate, the inner with broad pale chartaceous margins; new heads well formed at expanding of the earlier ones. . . . . 2. *C. microcephala.*
Involucre 8–13 mm. long, only sparsely lanate; phyllaries linear and herbaceous except for the very narrow margins; first heads greatly overtopped by stiffly ascending branches and branchlets terminated by undeveloped heads. . . . . 3. *C. Correllii.*
a. Plants with prolonged flagelliform or filiform prostrate stolons and eventual slender rhizomes.
Involucre glabrous or nearly so except for the glandular phyllaries; the outer gland-bearing phyllaries not merging into the scattered upper leaves of the peduncles. 4. *C. adenolepis.*
Involucre pilose to silky-lanate, glands if present partly hidden or inconspicuous, outer phyllaries gradually merging into the often imbricated leaves of the peduncles.
Principal phyllaries broadly linear to linear-lanceolate or narrowly oblong, 1–1.4 mm. broad, chartaceous except for green midrib.
Inflorescence a loose and open corymbiform panicle, with elongate slender branches. . . . . 5. *C. nervosa.*
Inflorescence a slender cylindric thyrsiform panicle with abbreviated erect branches. . . . . 5a. *C. nervosa,* var. *virgata.*
Principal phyllaries narrowly linear, 0.6–1 mm. broad, strongly herbaceous except for very narrow scarious margins. . . . . 5b. *C. nervosa,* var. *stenolepis.*

1. C. graminifolia (Michx.) Ell. Sk. ii. 334 (1824); DC. Prodr. v. 326 (1836); Bertol. Misc. Bot. vii. 33, t. 3 (1848), Bertoloni's plate being excellent, his description accurate: "Fibrae radicales e rhizomate brevissimo ortae . . . Folia . . . radicalia caespitosa, . . . Pedunculi monocephali, foliis exiguis, paucis instructi, glandulisque stipitellatis adspersi. Calathus imbricatus, squamis lanceolato-linearibus, acutis,

Photo. B. G. Schubert.

CHRYSOPSIS CORRELLII: FIG. 1, TYPE, × 2/5; FIG. 2, head, × 4. C. MICROCEPHALA: FIG. 3, head, × 4.

Photo. B. G. Schubert.

Chrysopsis adenolepis: fig. 1, type, × 2/5; fig. 2, head, × 4.
C. graminifolia: fig. 3, head, × 4.

dorso hirtis glandulis stipitellatis". *Inula graminifolia* Michx. Fl. Bor.-Am. ii. 122 (1803); Nutt. Gen. ii. 151 (1818). *Erigeron glandulosus* Poiret in Lam. Encycl. Meth. viii. 487 (1808), not Walt. *Diplopappus graminifolius* (Michx.) Less. in Linnaea, v. 144 (1830) at least as to basinym. *Pityopsis graminifolia* (Michx.) Nutt. in Trans. Am. Phil. Soc. n. s. vii. 317 (1841). *C. aspera* Shuttlew. ex Gray, Syn. Fl. N. Am. i^2. 121 (1884) in synonymy; Small, Fl. Se. U. S. 1182 (1903). *C. graminifolia*, var. *aspera* (Shuttlew.) Gray, Syn. Fl. N. Am. 1^2. 121 (1884). *Pityopsis aspera* (Shuttlew.) Small, Man. Se. Fl. 1341 (1933).—Siliceous or argillaceous pine or oak woods and openings, northern Florida to Mississippi, north to Virginia. The following selected from a large representation, are characteristic. VIRGINIA: Bowling Green, Caroline County, *Fernald & Long*, no. 9174; Urbanna, Middlesex County, *Hermann*, no. 10,425; 3 miles north of Williamsburg, James City County, *Menzel*, no. 119; Campus, University of Richmond, Henrico County, *M. Ryland;* Chester, Chesterfield County, *Smith & Hodgdon* in Pl. Exsicc. Gray, no. 889; headwaters of Blackwater River, Prince George County, *Fernald & Long*, no. 6711; Gary Church, Prince George County, *Fernald & Long*, no. 6712; Disputanta, Prince George County, *Fernald & Long*, no. 6418. NORTH CAROLINA: Middlesex, Nash County, *Godfrey*, no. 5430; Oxford, Granville County, *Godfrey*, no. 5533; Raleigh, Wake County, *Biltmore Herb.*, no. 1955a; Reidsville, Rockingham County, *Godfrey*, no. 6108; Greensboro, Guilford County, *Wm. Rhoades;* Winston-Salem, Forsyth County, *Schallert;* Sanford, Lee County, *Godfrey*, no. 6894; 10 miles north of Laurinburg, Scotland County, *Godfrey*, no. 5430; between Blowing Rock and Lenoir, Wautaga County, *A. B. Seymour*, no. 65; between Gold Hill and Falls of the Yadkin, Stanley County, *Small & Heller.* SOUTH CAROLINA: west of McBee, Chesterfield County, *Godfrey*, no. 8076; 14 miles south of Columbia, Lexington County, *Godfrey & Tryon*, no. 1302; Caesar's Head, Greenville County, *J. D. Smith.* GEORGIA: Athens, Clarke County, *Wiegand & Manning*, no. 3192; Angusta, ex herb. *Thurber;* north of Quitman, Brooks County, *Harper*, no. 1619. FLORIDA: Live Oak, Suwanee County, *Curtiss*, no. 6939; ? St. Marks, Wakulla County, *Rugel*, no. 484. ALABAMA: southwest of Booth, Autaga County, *Harper*, no. 3265; east of Notasula, Macon County, *Wiegand & Manning*, no. 3191; 16 miles south of Dothan, Houston County, *Wiegand & Manning*, no. 3190; Tensaw, Baldwin County, *Tracy*, no. 8022; west of Mobile, Mobile County, *Harper.* MISSISSIPPI: Ocean Springs, Jackson County, *Seymour & Earle*, no. 91821.43; Biloxi, Harrison County, *Tracy*, no. 4337. PLATE 742, FIG. 3; MAP 1.

As contrasted with *Chrysopsis nervosa* and its varieties, the

only other species of Virginia, *C. graminifolia* shows a pronounced preference for the Piedmont region. As pointed out in an earlier paper we have not found it on the outer coastal sands; nor does it occur in the most sterile pine barrens of the state.

2. C. microcephala Small, Fl. Se. U. S. 1182 and 1339 (1903). *Pityopsis microcephala* (Small) Small, Man. Se. Fl. 1341 (1933).—Sandy pineland and sand hills, Florida to eastern Texas, north to southeastern North Carolina, northeastern South Carolina, southern Arkansas and southeastern Oklahoma. The following are characteristic. North Carolina: near Southport, Brunswick County, *Godfrey & Shunk*, no. 4141. South Carolina: Hartsville, Darlington County, *Eggleston*, no. 4936; west of Salters, Williamsburg County, *Godfrey & Tryon*, no. 511 (with unusually large and subglabrate involucre, presumably from growing in a drainage-ditch); Santee Canal, Berkeley County, *Ravenel;* west of Bonneau, Berkeley County, *Godfrey & Tryon*, no. 1618; west of Jamestown, Berkeley County, *Godfrey*, no. 8175. Georgia: Folkston, Charlton County, *Francis Harper*, no. 668 (as *Aster*). Florida: Jacksonville, Duval County, *Curtiss*, no. 5319 (isotype); Lake City, Columbia County, *Nash*, no. 2492 (very narrow-leaved); Starks, Volusia County, *Grace Gilbert;* Homestead, Dade County, *Small, DeWinkler & Mosier*, no. 11,162; Marcs, Lee County, *Hitchcock*, No. 138 (slender-leaved). Alabama: Gateswood, *Tracy*, no. 8566. Arkansas: near Malvern, Hot Springs County, *E. J. Palmer*, no. 29,579. Oklahoma: Page, LeFlore County, *G. W. Stevens*, no. 2623. Texas: Houston, *E. J. Palmer*, no. 12,727. Plate 741, fig. 3; map 2; a southern Coastal Plain species.

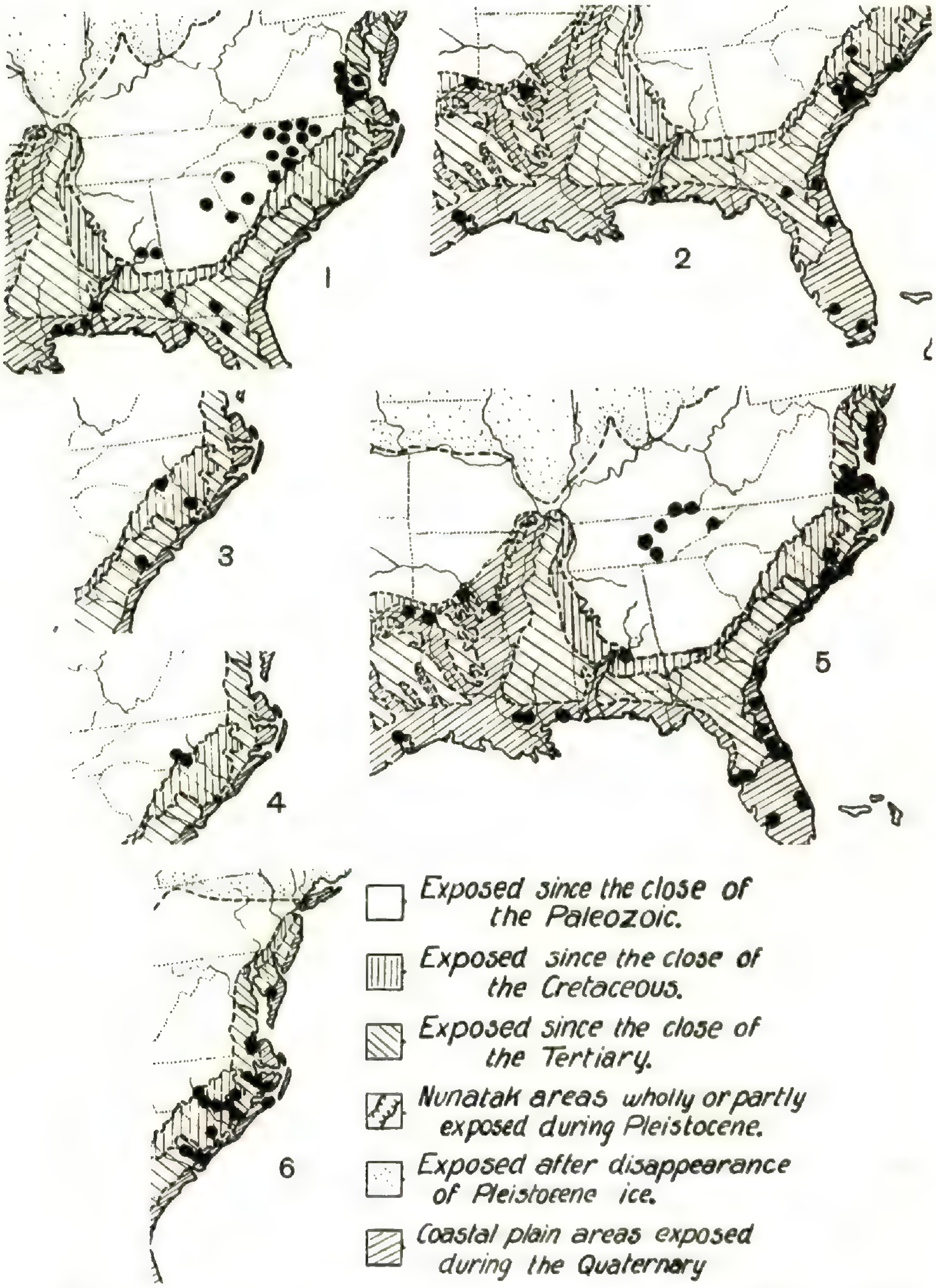
3. C. **Correllii,** sp. nov. (tab. 741, fig. 1 et 2). Perennis subcespitosa; foliis radicalibus confertis erectis lineari-lanceolatis elongatis argenteo-sericeis; caulibus 1–4 rigidis scopiformibus 3–7.5 dm. altis argenteo-sericeis; foliis caulinis adpressis; paniculis rigidis corymbiformibus ramis valde adscendentibus; pedunculis imbricato-foliaceis, precosioribus ramulis elongatis capitula immatura gerentibus valde superatis; involucro turbinato 8–13 mm. longo basi sparse lanato, phyllaribus valde imbricatis herbaceis viscidis anguste lineari-attenuatis, majoribus 0.5–0.8 mm. latis; ligulis luteis; pappo sordido.—Southeastern North Carolina and southeastern South Carolina. North Carolina: sandy region at White Lake, Bladen County, July 15, 1935, *Correll*, no. 2577 (type in Herb. Gray.); White Lake, August 14, 1938, *Godfrey*, no. 5985; moist rich soil along Drowning Creek, near Wagram, Scotland County, June 18, 1935, *Correll*, no. 1168. South Carolina: sandy bank, 8 miles south of Hendersonville, Colleton County, July 19, 1927, *Wiegand & Manning*, no. 3186. Map 3.

Chrysopsis Correllii is a very early-flowering species, beginning to flower in mid-June. The type (PL. 741, FIG. 1), with only a few fully developed heads and many erect broom-like branchlets with incipient heads, is as far along (July 15) as Godfrey's material of August 14 from the same locality. Correll's other number, collected June 18, is essentially as mature. When the heads terminating the erect lateral branchlets come to anthesis the central heads would doubtless be over-ripe. Although the herbaceous phyllaries are not stipitate-glandular they are so viscid as to adhere closely to the pressing paper. The species seems to be a very local one. It is a great pleasure to associate with it the name of DONOVAN STEWART CORRELL, who has so extensively explored the flora of the Carolinas.

4. C. **adenolepis** sp. nov. (TAB. 742, FIG. 1 et 2). Planta valde stolonifera, stolonibus flagelliformibus bracteoliferis elongatis; foliis imis lineari-lanceolatis prolongatis argenteo-sericeis vel sublanatis, superioribus valde reductis; caule erecto sericeo 4–4.5 dm. alto corymbiformi-paniculato; pedunculis filiformibus stipitato-glandulosis remote bracteolatis; involucris turbinatis 8–10 mm. altis, phyllaribus multi-seriatis linearibus vel anguste lineari-lanceolatis glabris dorso viridibus margine scarioso-chartaceis, exterioribus dorso stipitato-glandulosis; ligulis flavis; pappo sordido-rufescenti.—Moore County, NORTH CAROLINA. old barren fields, Pinehurst, August 19, 1897, *Otto Katzenstein* (TYPE in Herb. Gray.); sandy roadside, near West End, June 30, 1927, *Wiegand & Manning*, no. 3185.

In its glandular involucre at once suggesting *C. graminifolia* of which, when understood, it may prove to be an extreme variation. The flagelliform stolons, the only minutely glandular peduncles and the very slender phyllaries seem to distinguish it. The development or failure to develop flagelliform stolons is so general a character through large and consistent series of specimens that I am giving it much weight in separating *C. adenolepis*. MAP 4.

5. C. **nervosa** (Willd.), comb. nov. *Erigeron nervosum* Willd. Sp. Pl. iii[3]. 1953 (1803). *Inula argentea* Pers. Syn. ii. 452 (1806); Nutt. Gen. ii. 151 (1818). *C. argentea* (Pers.) Ell. Sk. ii. 334 (1824); DC. Prodr. v. 326 (1836). *Pityopsis argentea* (Pers.) Nutt. in Trans. Am. Phil. Soc. n. s. vii. 318 (1841). *C. graminifolia* sensu most recent auth., not (Michx.) Ell.—Bearing elongate flagelliform basal stolons; stems 1–4, 0.15–1.2 m. high; panicle open, with elongate slender branches (rarely with only



Map 1, Range of Chrysopsis graminifolia; map 2, of C. microcephala; map 3, of C. Correllii; map 4, of C. adenolepis; map 5, of C. nervosa; map 6, of C. nervosa, var. stenolepis.

1–few heads); involucre 8–13 mm. high, silky-pilose to -lanate, without stipitate glands, the short outer phyllaries passing insensibly into the crowded or imbricated silky upper bracts of the peduncles; the longer scario-chartaceous phyllaries linear to linear-lanceolate or narrowly oblong, 1–1.4 mm. broad.—Dry to moist sandy pine or oak woods, thickets, ridges or openings, or siliceous rock in the interior, Coastal Plain from Florida to eastern Texas, north to southern Delaware, central Arkansas and southeastern Oklahoma; Pine Mountain, southeastern Kentucky, and Cumberland Plateau to Great Smoky Mountains, Tennessee. The following, from a large representation, are representative. DELAWARE: near Terrapin Hill, southwest of Laurel, August 5, 1874, *A. Commons* (although Persoon's *Inula argentea* was said to have come from Pennsylvania and an old specimen in the Gray Herbarium bears in the hand of Elias Durand the data "N. Jersey", I find no authentic record of the plant from north of southern Delaware). MARYLAND: Salisbury, October 3, 1863, *Canby*, with the note: "To show the runners" (more than 3 dm. long). VIRGINIA: Old Town Neck, Northampton County, *Fernald, Long & Fogg*, no. 5503; west of Kiptopeke, Northampton County, *Fernald, Long & Fogg*, no. 5504; Cape Henry, Princess Anne County, *Tidestrom*, no. 3065, *Killip*, no. 6750; Virginia Beach, Princess Anne County, *K. K. Mackenzie*, no. 1729, *Fernald & Griscom*, no. 2913; near Franklin in Isle of Wight County, *Heller*, no. 1122; south of Factory Hill, Nansemond County, *Fernald & Long*, no. 6884; Nottoway Swamp, west of Franklin, Southampton County, *Fernald & Long*, no. 9636; Point Beach, south of Franklin, *Fernald & Long*, no. 11,457. NORTH CAROLINA: 5 miles west of Clinton, Sampson County, *Godfrey*, no. 4525; Carolina Beach, New Hanover County, *Godfrey*, no. 4671; Old Dock, Columbus County, *Godfrey & Shunk*, no. 4179. GEORGIA: Blackbeard Island, *McAtee*, no. 3331. FLORIDA: near Jacksonville, *Curtiss*, no. 1359; DeLand, Volusia County, *G. D. Hurst;* Orlando, February, 1889, *Canby:* Okeechobee region, Brevard County, *Fredholm*, no. 6338; Earman, Palm Beach County, *F. R. Randolph*, no. 59; west of Jupiter, Palm Beach County, March 15, 1924, *Harper;* St. Petersburg, *Mrs. Chas. C. Deam*, no. 2909; Hillsborough County, *Fredholm*, nos. 6481 and 6492; Fort Myers, *J. P. Standley*, nos. 27 and 87. KENTUCKY: Pine Mountain, Bell County, *Kearney*, no. 405; Pine Knot, McCreary County, *H. J. Rogers*, no. 85. TENNESSEE: at 2300 ft. alt., Rugby, Morgan County, *Svenson*, no. 4096; at 2300 ft. alt., 8 miles east of Crossville, Cumberland County, *Svenson*, no. 4147; Wolf Creek, Cocke County, *W. A. Anderson*, no. 1115; Hiwassee Valley, *Ruth*, no. 27. ALABAMA: northeast of Autaugaville, Autauga County, *Harper*, no. 3270. MISSISSIPPI: Biloxi, *Tracy*, no. 6444. ARKANSAS: Rose Bud,

White County, *Demaree,* no. 10,918; Pulaski Heights, Little Rock, *Demaree,* no. 8148; Blue Mountain, Pulaski County, *Demaree,* no. 8808; Counterfit Hollow, northwest of Murfreesboro, Pike County, *Demaree,* no. 9761. Louisiana: vicinity of Covington, *Arsène,* no. 11,431; southwest of Hammond, Tangipahoa Parish, *D. S. & H. B. Correll,* no. 9268. Oklahoma: Broken Bow, McCurtain County, *Hopkins & Van Valkenburgh,* no. 6146. Texas: presumably near Houston, *Lindheimer,* no. 89. Plate 743, fig. 3 and pl. 744, fig. 3; map 5.

*Var. **virgata,** var. nov. (tab. 744, fig. 1 et 2), paniculis anguste cylindrico-thyrsiformibus ramis erectis valde abbreviatis. Virginia: vicinity of Norfolk, autumn of 1906, *M. C. Jensen;* dry open sandy soil northwest of Magnolia, Nansemond County, October 17, 1941, *Fernald & Long,* no. 14,036 (type in Herb. Gray.; isotype in Herb. Phil. Acad.). See p. 371.

*Var. **stenolepis,** var. nov. (tab. 743, fig. 1 et 2), var. typicae similis, phyllaribus longioribus anguste linearibus 0.6–1 mm. latis valde herbaceis margine angusto scarioso exceptis.—Pinelands and pine barrens, eastern Maryland to South Carolina. Maryland: open pine woods along Tonytank Creek, 2½ miles south of Salisbury, September 8, 1938, *R. R. Tatnall,* no. 3971 (transitional). Virginia: dry sandy pine barrens south of Zuni, Isle of Wight County, August 24, 1936, *Fernald & Long,* no. 6710; white sand of dry pine barrens, south of Lee's Mill, Isle of Wight County, August 23 and September 2, 1940, *Fernald & Long,* no. 12,860; sandy and peaty pine barrens, east of Cox Landing, south of South Quay, Nansemond County, September 15 and 22, 1939, *Fernald & Long,* no. 11,456. North Carolina: pine woodland, McCullen, Wake County, July 12, 1938, *Godfrey,* no. 4950; pineland, Chocowinty, Beaufort County, July 20, 1938, *Godfrey,* no. 5410; dry sand, Snow Hill, Greene County, July 8, 1922, *L. F. & F. R. Randolph,* no. 756; sand ridge near Goldsboro, Wayne County, September 3, 1938, *Godfrey,* no. 6555; low pineland, Dunn, Hartnett County, August 25, 1938, *Godfrey,* no. 6126; pineland near Lilington, Hartnett County, August 5, 1938, *Godfrey* no. 5638; pineland at Fort Barnwell, Craven County, October 13, 1938, *Godfrey & White,* no. 6832; pineland, Grantsboro, Pamlico County, October 13, 1938, *Godfrey & White,* no. 6828; open woodland, Olympia, Pamlico County, July 12, 1922, *L. F. & F. R. Randolph,* no. 910 (type in Herb. Gray.); pineland near Atlantic, Cartaret County, September 1, 1938, *Godfrey,* no. 6421; open pinelands, Jacksonville, Onslow County, July 20, 1922, *L. F. & F. R. Randolph,* no. 995; pineland near Hallsboro, Columbus County, August 29, 1938, *Godfrey,* no. 6286. South Carolina: excavated, coarse white sandy pockets in pine barrens, 5 miles south of Kingstree, Williamsburg County, August 23, 1939, *Godfrey & Tryon,* no.

1647 (phyllaries unusually blunt); grass-sedge bog or savannah, 12 miles north of Georgetown, June 23–24, 1939, *Godfrey & Tryon*, no. 106; burned-over savannah, 5 miles south of Andrews, Georgetown County, August 11, 1939, *Godfrey & Tryon*, nos. 1372 and 1378. MAP 6.

Var. *stenolepis*, although habitally inseparable from typical *Chrysopsis nervosa*, seems to be a fairly marked variety of pinelands chiefly of southeastern Virginia and the Carolinas. Var. *virgata*, known only from a limited area in southeastern Virginia, within the range of typical *C. nervosa*, may prove to be only a vegetative form. Typical *C. nervosa*, with one area at high altitude on the Appalachian Upland, the other following much of the Coastal Plain, illustrates the large group of species which, presumably, has retained a foothold on the old core of the continent, where, except in highly silicious soils, conditions are less favorable for them than on the younger sands of the Coastal Plain. It is strongly contrasted with *C. graminifolia*, which has its great development on the Piedmont east of the Alleghenies and on the inner Coastal Plain. It is not wholly satisfactory to keep *C. Tracyi* Small specifically apart from *C. nervosa*. Until the Floridan series is more thoroughly studied I am leaving them apart, as I am an unidentified plant of Florida with stiff branches often overtopping the inflorescences.

IN PLATE 741, FIGS. 1 and 2 are of CHRYSOPSIS CORRELLII: FIG. 1, TYPE × 2/5; FIG. 2, head, × 4. FIG. 3, head, × 4, of C. MICROCEPHALA, from ISOTYPE. PLATE 742, FIGS. 1 and 2, C. ADENOLEPIS, from TYPE: FIG. 1, plant, × 2/5; FIG. 2, head, × 4. FIG. 3, head, × 4, of C. GRAMINIFOLIA from near Bowling Green, Virginia, *Fernald & Long*, no. 9174. PLATE 743, C. NERVOSA, var. STENOLEPIS: FIG. 1, portion of small plant, × 1, from east of Cox Landing, south of South Quay, Virginia, *Fernald & Long*, no. 11,456; FIG. 2, head, × 4, from the TYPE. FIG. 3, inflorescence, × 1, of 2-headed plant of C. NERVOSA, from Old Town Neck, Northampton County, Virginia, *Fernald, Long & Fogg*, no. 5503. PLATE 744, FIGS. 1 and 2, C. NERVOSA, var. VIRGATA, from the TYPE: FIG. 1, plant, × 1/3; FIG. 2, head, × 4. FIG. 3, head, × 4, of typical C. NERVOSA from near Factory Hill, Virginia, *Fernald & Long*, no. 6884.

SOLIDAGO BICOLOR L., var. OVALIS Farwell. To the recorded stations add others. ISLE OF WIGHT COUNTY: seeping calcareous wooded bluffs by James River, west of old Fort Boykin, no. 13,175. GREENSVILLE COUNTY: wooded bottomland of Nottoway River below Double Bridge, north of Orion, no. 13,802.

S. ARGUTA Ait. On the calcareous bluffs along the lower James, west of old Fort Boykin, this and other species reach phenomenal size, our no. 13,176 having basal leaves up to 3.4 dm. long and 1 dm. broad, no. 13,804 being 2 m. high, with panicle-branches nearly 5 dm. long. See p. 345.

S. perlonga Fern. Range extended 25 miles inland to southwestern Dinwiddie County: very abundant in open argillaceous low woods just east of McKenney, no. 14,042. See p. 373.

S. Elliottii T. & G. Add stations in Norfolk County: in dense cane (*Arundinaria*) scrub, north of Cornland, nos. 14,039 and 14,040.

S. fistulosa Mill. Thickets of this species along the Feeder Ditch from Lake Drummond, Norfolk County, reach a height of 2.25 m., no. 13,836.

Boltonia asteroides, var. glastifolia (Hill) Fern. Frequent on tidal marshes and shores of Chickahominy River to head of tide in New Kent and Charles City Counties, sometimes up to 1.6 m. high, the ligules white or lilac (many nos.). See p. 357.

Aster grandiflorus L. Range extended inland to southwestern Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,051.

*A. racemosus Ell. Norfolk County: dry open ground east of Cedarville, no. 14,052; the first from north of South Carolina. See p. 369.

A. pilosus Willd., var. demotus Blake. On the sand-beach of James River, Claremont, becoming shrubby, the new flowering branches of the year arising from among the old fruiting branches of the preceding year (no. 13,820). See p. 363.

*A. Elliottii T. & G. Range extended north into Princess Anne County: reed-marsh along Blackwater River, southwest of Pungo Ferry, no. 14,054—ligules rosy-pink. See p. 370.

Erigeron pulchellus Michx. Local range extended into Nansemond County: forming extensive carpets in dry sandy woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, no. 13,481.

*Pluchea purpurascens (Sw.) DC., var. succulenta Fernald in Rhodora, xliv. 227 (1942), forma **obovata,** f. nov., foliis late obovatis basi subcuneatis apice rotundatis emarginatisve.—Virginia: tidal marsh along Powhatan Creek, north of Jamestown Island, James City County, August 22, 1939, *Fernald & Long*, no. 11,191 (type in Herb. Gray.).

An extraordinary form, with broadly obovate leaves strongly rounded to emarginate at summit, typical var. *succulenta* having the rhombic- to oblong-ovate leaves tapering to tip.

Helianthus angustifolius L. Range extended inland to southwestern Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,058. See p. 373.

*Coreopsis oniscicarpa Fernald, var. **simulans,** var. nov., foliis radicalibus late oblanceolatis vel subellipticis 1.2–2 cm. latis; phyllaribus externis deltoideo-ovatis margine albido-

hyalinis ad 5 mm. longis et 2 mm. latis, phyllaribus internis pallide brunneis; ligulis 0.6–1.2 cm. longis.—Nansemond County, VIRGINIA: sandy ditch at border of low woods northeast of Baines Hill School, September 12, 1941, *Fernald & Long*, no. 13,827 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.), October 16, 1941, no. 14,061 (fruit from same colony). See pp. 368 and 371.

Typical *Coreopsis oniscicarpa* Fernald in RHODORA, xl. 472, pl. 533 and 534, figs. 1, 5 and 8 (1938) has the narrowly oblanceolate basal leaf-blades only 0.5–1 cm. broad; the outer phyllaries deltoid-lanceolate to lance-oblong, only 0.7–3 mm. long and less whitened at the margins; the inner phyllaries dark brown to fuscous; the ligules 0.8–1.8 cm. long. Var. *simulans* has broader basal leaves (1.2–2 cm. broad); the outer phyllaries deltoid-ovate, prominently pale-margined, and mostly 3–5 mm. long; the inner phyllaries pale brown; and the ligules constantly short (only 0.6–1.2 cm. long). Its achenes are in no way different from those of typical *C. oniscicarpa.* The varietal name is given because, in the broad basal leaves and in the shape of the outer phyllaries, var. *simulans* slightly suggests the more southern *C. linifolia* Nutt.—see Fernald in RHODORA, xlii. 496, 497, pl. 649 (1940). In that species of the extreme South, however, the outer phyllaries are round-ovate (in *C. oniscicarpa*, var. *simulans* deltoid), the inner ones (as well as the outer) with pale margins; the ligules 1.3–2.5 cm. long (in var. *simulans* 0.6–1.2 cm.); and the bodies of the achenes 2.5–3.2 mm. long and 1–1.2 mm. broad. In the more northern *C. oniscicarpa* and its var. *simulans* they are 1.8–2.2 mm. long and 0.6–0.9 mm. broad. Although simulating *C. linifolia*, the new *C. oniscicarpa* var. *simulans* clearly belongs with the latter species.

*COREOPSIS TINCTORIA Nutt., forma **atropurpurea** (Hook.), stat. nov. Var. *atropurpurea* Hook. Bot. Mag. lxiii., t. 3511 (1836). SOUTHAMPTON COUNTY: roadside bank, south of Franklin, no. 13,186.

*BIDENS CORONATA L., var. BRACHYODONTA Fernald. NEW KENT COUNTY: fresh tidal marsh of Pamunkey River, south of White House, no. 11,635. PRINCESS ANNE COUNTY: reed-marsh along Blackwater River, southwest of Pungo Ferry, no. 14,066. NORFOLK COUNTY: damp old clearings and thickets, eastern side of Great Dismal Swamp, north of Wallaceton, nos. 13,829, 13,830 and 14,064.—Extension south from Delaware. See pp. 366 and 371.

*Cosmos bipinnatus Cav. The commonly cultivated species, frequently seen on dumps and in waste ground. In dry sandy woods north of Orion, Greensville County, apparently naturalized, some large plants with the expanded heads 5–6 cm. broad, others, in poorer soil, with them only 2–3 cm. across (nos. 14,062 and 14,063).

Senecio obovatus Muhl. Range extended down the James to Isle of Wight County: seeping calcareous wooded bluffs west of old Fort Boykin, no. 13,187. See p. 345.

Cirsium virginianum (L.) Michx. Range extended inland to southwestern Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,070. See p. 373.

*Sonchus oleraceus L., forma lacerus (Willd.) G. Beck. James City County: calcareous fossiliferous bluff by James River, Grove Landing, southeast of Grove, no. 13,488; a relatively rare form in America.

*S. asper (L.) Mill., forma inermis (Bisch.) G. Beck. Isle of Wight County: with typical *S. asper* on dry calcareous bluff by Burwell's Bay, James River, at Bailey's Beach, near Rushmere, no. 13,188.

*Lactuca canadensis L., var. obovata Wieg., forma Steelei (Britton) Fernald in Rhodora, xl. 481 (1938). *L. Steelei* Britton. Range extended south to King William County: border of sandy oak woods southwest of Aylett, no. 13,489.

*Prenanthes serpentaria Pursh, forma **simplicifolia,** f. nov., foliis oblongis vel elliptico-lanceolatis.—Virginia: rich woods and bushy clearing just east of the "fall-line" along Nottoway River, Double Bridge, about 6 miles northwest of Jarratt, Sussex County, September 21, 1939, *Fernald & Long*, no. 11,485 (type in Herb. Gray.; isotype in Herb. Phil. Acad.); Bedford County, October 6, 1871, *A. H. Curtiss.*

Prenanthes serpentaria is ordinarily the most stable species of our flora in its foliage. Typically the lower and median leaves are of an ovate outline and deeply lobulate, whereas the foliage of *P. trifoliolata* (Cass.) Fernald and *P. altissima* L. is variable without seeming limit. Forma *simplicifolia* is, therefore, a noteworthy departure from typical *P. serpentaria.* It is possible that it may be *Nabalus integrifolius* Cass., basis of *N. Fraseri*, var. *integrifolius* (Cass.) Torr. & Gray. Without close study of Cassini's type it would be unsafe to guess, since Torrey & Gray and, after them, Gray did not distinguish *P. serpentaria* and *Nabalus Fraseri* from the polymorphic northern *P. trifoliolata* (Cass.) Fernald, which sometimes has unlobed leaves.

Scirpus **koilolepis**, comb. nov.—This little plant of our southern states was apparently first made known to science by Torrey in 1836, under the name *Isolepis carinata* Hook. & Arn. Steudel, ignorant of Torrey's name, later described it as *Isolepis koilolepis*, basing his species on the same collection of Drummond which Torrey had seen. Gray and a year later Boeckeler independently transferred the species to *Scirpus* and it has since appeared in American literature as *S. carinatus* (Hook. & Arn.) Gray. It seems to have been generally overlooked that Smith used the binomial *Scirpus carinatus*, with illustrations, for a very different plant in several works and several editions in England over a long period of years prior to 1836. Since *S. carinatus* is obviously a homonym, as indicated by Mohr as early as 1901, another specific epithet is required and the need is apparently satisfied by Steudel's name. The transfer is hereby made. Purists noting the original spelling *koilolepes* will find that this typographical error was corrected by Steudel in his index.

Scirpus **koilolepis** (Steud.) Gleason, comb. nov. *Isolepis carinata* Hook. & Arn.; Torr. Ann. Lyc. N. Y. 3: 349. 1836. *Isolepis koilolepis* Steud. Syn. Cyp. 318. 1855. *Scirpus carinatus* Gray, Proc. Am. Acad. 7: 392. 1868. Homonym of *S. carinatus* Sm.; Sowerby, Engl. Fl. 28: pl. 1983. 1809.—H. A. Gleason, New York Botanical Garden.

TRANSFERS IN SCIRPUS § ACTAEOGETON

M. L. Fernald

Scirpus **Purshianus,** nom. nov. *S. debilis* Pursh, Fl. Am. Sept. i. 55 (1814), not Lam. (1791).

S. Purshianus, forma **Williamsii** (Fernald), stat. nov. *S. debilis*, var. *Williamsii* Fernald in Rhodora, iii. 252 (1901). *S. Smithii*, var. *Williamsii* (Fernald) Beetle in Am. Journ. Bot. xxix. 655 (1942), as to type, not as to other specimens cited, which belong in part to typical *S. Purshianus*, in part to *S. Smithii*, forma *setosus*.

S. Smithii Gray, forma **setosus** (Fern.), stat. nov. *S. Smithii*, var. *setosus* Fernald in Rhodora, iii. 252 (1901).

S. Smithii, forma **levisetus** (Fassett), stat. nov. Var. *levisetus* Fassett in Rhodora, xxv. 42 (1921).

As pointed out by Beetle in his *Studies of the Genus Scirpus L. V. Notes on the Section Actaeogeton* in Am. Journ. Bot. xxix. 655

(1942), the well known annual species, *S. debilis* Pursh, is antedated by Lamarck's wholly different species of the same name. Although Beetle reduces Pursh's species to varietal rank under *S. Smithii* Gray, it is very doubtful if botanists who understand the two plants will at all subscribe to the uniting of the two. Those who have really understood our eastern species of *Cyperaceae*, conservative men like the late Asa Gray, Charles E. Smith, Witmer Stone, Ezra Brainerd and K. M. Wiegand, to mention only a few, clearly recognized them as distinct; and all living botanists who accurately know living plants in the field find them abundantly distinct. From his account of the two, as *S. Smithii* and *S. Smithii*, var. *Williamsii* (*S. debilis* Pursh), it is clear that Dr. Beetle has missed the significant characters and there is no indication from his citation of specimens that he has studied them in the field. His key to the two is as follows:

"Achene sharply trigonous.
  Achene obscurely roughened.
    Involucral bract strictly erect, ½ to ⅔
      length of plant......................5. *S. fistulosus* [African]
    Involucral bract often divergent or
      incurved, not more than ¼ length of plant.
      Culms rigid, yellow-green, spikelets 1-many;
        upper sheaths bladeless..............11. *S. smithii* var. *williamsii*
      Culms flaccid, dull green; spikelets 1–3;
        upper sheaths blade-bearing................10. *S. smithii*"

Although *S. Smithii* can be reached in this key only through "Achene sharply trigonous", the fuller description of the species definitely and correctly says "style 2-fid; achene . . . plano-convex" and then adds "or obscurely trigonous". The "trigonous" quality is most difficult to find in any real *S. Smithii* and, surely, it is difficult to understand how an ovary with "style 2-fid" can develop into an "Achene sharply trigonous." I have worked with *Cyperaceae* for more than fifty years and never met such a case. The term plano-convex, regularly used in describing the achene of *S. Smithii* is correct; the shining black and cuneate-obovate achene is flat on one face, gently convex on the other. As to the involucre of *S. Smithii*, no one could properly reach that species if he looked for a divergent or appreciably incurved bract "not more than ¼ length of plant"; for the bract, as correctly described by Asa Gray, who understood his own species, is "always erect", or it is at most incon-

spicuously arched at the subacute tip and in all well developed specimens it is ½ to ⅓, instead of "not more than ¼ length of plant", although exceptionally shorter. When Gray separated *S. Smithii* from *S. debilis* Pursh, the new species "Named for C. E. Smith, who indicated and insisted on its distinctions", he noted the upper sheath "often leaf-bearing". This is made by Beetle a definite character, but fuller and more recent material shows that the upper sheath may be bladeless in *S. Smithii* or with blades in *S. Purshianus* (*S. debilis* Pursh). Gray's original material of *S. Smithii* had only "1–3 . . . acute spikes", as against "3–12 . . . obtuse" ones in *S. debilis;* but further material shows that, although conically acutish, they may be as many as 9. There is no magic in the "1–3" relied upon by Beetle, who saw specimens in the Gray Herbarium which he borrowed and re-labeled, with thrice that number. Beetle reasons that the divergence of the short and round-tipped bract in *S. Purshianus* (*S. debilis*) is "merely a forcing back due to the position of the fourth spikelet". If that is all there is to it, why do the plants of *S. Smithii* with 4–9 spikelets have erect bracts; why is the bract much longer in proportion to the height of the culm than in *S. Purshianus;* why are the tips of bracts and basal blades in *S. Smithii* acutish, those of *S. Purshianus* rounded and callous; why is the culm of the latter obtusely trigonous and with concave sides, while in *S. Smithii* it is subterete, with rounded sides; why are the spikelets of *S. Purshianus* blunt, those of *S. Smithii* more acutish; why are the scales of the former roundish-ovate, becoming brown on the sides, while those of *S. Smithii* are oblong-ovate and greener or paler brown; why are the bristles (when present) in *S. Purshianus* coarse and coarsely retrorse-barbed, while, when developed, in *S. Smithii* they are strikingly delicate; why are the olivaceous to brown or dull black achenes of *S. Purshianus* round-obovoid and bulged on both faces, while in *S. Smithii* they are cuneate-obovate, shining black, and flat on one face, only slightly curved on the other? The answer is clear to those who have long known the two in the field. It is simply because they are distinct species.

Although Beetle says (his p. 655) that "Apparently *S. smithii* is no more than an aquatic extreme of *S. debilis* . . . [which] never has more than three spikelets", there is nothing in the

habitats of the two to support this assumption. The type-locality of *S. Smithii*, to be sure, was on tidal shores of the Delaware, and elsewhere along the coast *S. Smithii* may occur on tidal shores, where at high tide it is temporarily drowned; but it is found on many shores which have had no pronounced tidal margins since the Champlain Subsidence, Lake Champlain and Lake Ontario, for instance, and on many inland small ponds of New England, New York, Indiana, Illinois and Minnesota, where the plants are never drowned by high tide. Asa Gray, with three collections of *S. Smithii*, clearly understood and defined the species. An accumulation of later material from scores of additional stations by field-botanists who have understood the plants has fully justified his differentiation of it.

As to the implication that *Scirpus Purshianus* (*S. debilis* Pursh) is a plant of drier habitats than *S. Smithii* (if the latter is "no more than an aquatic state" of the former) it may further be noted that plenty of accurate labels by the collectors indicate sometimes a pretty paludal to subaquatic habitat for the former ("bog-pond", "bed of Merrimack River", "wet meadow", "in and around sphagnous upland swamps", "bed of Shavers Fork", "Caricaceous marsh", etc.); while plenty of inland stations for *S. Smithii* are recorded thus: "sandy shore", "sand-flats", "sandy beach", "alluvial soil", "sand dunes" and in one case "ledges". *S. Smithii*, besides growing on sandy, muddy or mucky shores inland, frequently grows in fresh tidal sands and mud; *S. debilis* is rarely if ever in the latter habitats. In this connection the note by Wiegand & Eames in their Flora of the Cayuga Lake Basin, 98 (1926) is suggestive. In that area only typical *S. Smithii* is found, on "Sandy shores", but the authors say, "Probably influenced in its local occurrence by the well-known brackish conditions about Cayuga Lake".

Scirpus Purshianus of acid soils is a southern species, found from Georgia and Alabama northward to southwestern Maine, central New Hampshire, southern Vermont, southeastern New York, eastern Pennsylvania, West Virginia, southern Michigan, and Wisconsin. *S. Smithii*, chiefly of more basic soils, is northern, occurring from the estuary of the St. Lawrence, in Quebec, westward to Minnesota, and south to southern New England, the lower Delaware drainage of New Jersey, eastern Pennsyl-

vania and Delaware, possibly northeastern Virginia, western New York, northwestern Pennsylvania, northern Ohio and northern Indiana. If it is "no more than an aquatic extreme" of the former why does its northeastern range extend nearly 200 miles beyond, its southern range stop 600 miles short of the limits of *S. Purshianus*?

The varieties proposed in the past seem better treated as forms; their differences are in the presence or absence of perianth-bristles, or in case of *S. Smithii*, forma *levisetus*, the lack of retrorse barbs on the bristles. They all occur as localized colonies within the broad range of the two species, the latter form, like the type of the species, in tidal flats, *S. Purshianus*, forma *Williamsii* as an extremely local plant within an area where typical *S. Purshianus* abounds.

Note on S. Hallii.—In the same paper Beetle treats our very characteristic and highly localized *Scirpus Hallii* Gray as a variety of "*S. uninodis* (Delile) Boiss." of Africa, although he says "Eurasia". Delile described it from Egypt, and Boissier, who did not consider it specifically different from the Eurasian *S. supinus* L., calling it *S. supinus*, γ *digynus*, knew it only from a single Egyptian collection. *S. uninodis* was invalidly published by Boissier as a synonym and falsely ascribed to Delile, who had placed it in *Isolepis: S. supinus*, "γ *digynus*.—Stylus bifidus, nucula orbicularis lenticulari-biconvexa transverse obsolete et praesertim versus margines rugulosus.—*S. uninodis* Del. Descr. Eg. p. 132 sub *Isolepide* tab. 6, fig. 1." The proper author of the combination, *S. uninodis*, if it has ever been validly published, I leave to those who have to use it. This may be a needless search, for *Isolepis uninodis* Delile was published in 1813, while *S. lateralis* Forsk. Fl. Aegypt.-Arab. 15 (1775) is cited by C. B. Clarke in Thiselton-Dyer, Fl. Trop. Afr. viii. 453 (1902), as identical with it. Clarke, however, calling the plant *S. supinus*, var. *uninodis* (Delile) C. B. Clarke, was basing his variety merely on habital characters, not upon the achenes, and his identification, therefore, needs careful checking.[1]

[1] On the preceding page Clarke said, under *Scirpus supinus:* "The var. *Hallii* is frequent in North America". There are hundreds of botanists in North America who would like to find it "frequent"; it is perhaps the most infrequent member of the genus with us, famous and often cited as a relict species, with 1 station in Massachusetts, 1 in Georgia, 2 or 3 in Florida, 1 in Illinois, 1 in Texas.

The plant with plump-lenticular achenes is widely dispersed from Egypt to Senegal, but the Asiatic material which Beetle has marked *S. uninodis* in the Gray Herbarium has 3 styles and trigonous cuneate achenes. So far as I can find most critical students refer the Asiatic material to *S. supinus* L. Our *S. Hallii* with plano-convex and sharply and transversely ribbed achenes has little, except habit, in common with it. The African plant, as shown by Leprieur's material of it, has such different scales (almost uniformly colored, chartaceous and readily splitting under pressure) and such different achenes (much plumper than in ours and only obscurely cross-marked) that I am content to leave the plant of the United States as *S. Hallii* Gray. It would be almost if not quite unprecedented that an endemic plant of the United States should be a variation of an endemic of North Africa.

Beetle places *S. Hallii*, as *S. uninodis*, var. *Hallii*, under a division of his key with "Sheaths bladeless". Delile, in describing *Isolepis uninodis* said "Chaque chaume . . . terminée par une pointe courte foliacée"; and it is difficult to collect *S. Hallii* at its eastern Massachusetts station without getting blades up to 1 dm. long. Furthermore, in describing *S. Hallii* Gray correctly said "stems . . . sometimes 1-leaved above the middle", and the TYPE shows blades up to 1.5 dm. long. It is feared that in his treatment of the group the author of the recent study has relied more upon variable and inconstant vegetative characters than upon more stable and fundamental ones of the reproductive structures.

The Ferns and Fern Allies of Louisiana.—Drs. Brown and Correll have recently given us an excellent treatment of the *Pteridophyta* of Louisiana.[1] The book is unusually complete and accurate and presents a wealth of detail. Each of the sixty-six species, varieties, forms and hybrids is amply described. The species are illustrated by half-tones and notes of special interest on distribution, ecology and history are freely included. The phytogeography of an unusual element of northern species that occurs in the state is discussed in detail. Among the ferns it is represented by *Adiantum pedatum*, *Diplazium acrostichoides* and *D. pycnocarpon*.

[1] Brown, C. A. and Correll, D. S. The Ferns and Fern Allies of Louisiana. i–xii, 1–186. *f. 1–49*. Baton Rouge, Louisiana State University Press. July, 1942. $3.00.

The keys to the families, genera and species are well constructed and the contrasting characters have been carefully chosen. An ample glossary and bibliography are included. The authors have studied material in thirteen herbaria and the specimens upon which their study is based are cited. This puts the entire treatment on a firm basis of fact. It is an excellent example of how technical data can be added to a popular treatment without detracting from its value as a book that can be used by the layman.—R. M. Tryon, Jr., Dartmouth College.

Pentstemon laevigatus a Misnomer.—In determining the species of a *Pentstemon* collected early in July along a brook in a field below Pinkham Notch, New Hampshire, difficulty was experienced because of a discrepancy between the material and the descriptions in Gray's Manual. Although in all other respects the plants corresponded to *P. laevigatus* Ait. var. *Digitalis* (Sweet) Gray, they showed decussate lines of pubescence along the internodes, whereas the description of the species reads "glabrous to the inflorescence." The specific name in itself refuted this identification yet no other possibility appeared.

An examination of the material at the Gray Herbarium disclosed the fact that all the specimens that had ever been attributed to either *P. laevigatus* or the variety *Digitalis* have the same general type of pubescence as that observed in the Pinkham Notch material. Decussate lines of pubescence are always present in the two lowest internodes. These in many cases persist up to the inflorescence or to a node short of it, but are increasingly inconspicuous at each higher internode. In some specimens the hairs become diffuse on the higher internodes although the decussate distribution reappears close to the nodes.

Hence it appears that an oversight, which has persisted from the time of Aiton, resulted in the attribution of an inappropriate name to *P. laevigatus* and also in incorrect descriptions throughout the literature.—Jeannette E. Graustein, Women's College, University of Delaware, Newark, Delaware.

Volume 44, no. 527, including pages 414–452 and plates 725–736, was issued 7 November, 1942.

ERRATA

Page 28, line 15; for *Pseudoëpostoa* read *Pseudoëspostoa.*
Page 35, line 8; for *Hely-* read *Heli-.*
Page 66, line 29; *for* GRACILE *read* GRACILIS.
Page 70, line 17; *for* huachacae *read* huachucae.
Page 70, line 43; *for* Melia *read* Melica.
Page 147, line 21; *for* Kuntz *read* Kuntze.
Page 255, line 32; for *mollisissima* read *mollissima.*
Page 255, line 35; for *mollisissimus* read *mollissimus.*
Page 284, line 30; *after* nov. ADD *C. cristata,*
Page 340, line 12; for *ramosus* [last word] read *ramosum.*
Plate 712, in caption, line 7; *for* OCCALTANS *read* OCCULTANS.
Plate 718, in caption, line 1; *after* leaf *add in each case* $\times$ 3/7.
Plate 718, in caption, line 2; *for* open; all *read* open,
Page 357, line 15; for *virginiana* read *virginica*
Plate 719, in caption, line 1; *after* leaf *add in each case* $\times$ 2/5.
Plate 719, in caption, line 2; *after* open *add,* $\times$ 1.
Plate 719, in caption, line 2; *for* fruit; all *read* fruit,
Page 401, line 29; *for* world-war. In *read* world-war, in.
Page 401, line 31; for *truncata* read *subtruncata.*
Page 407, line 11; *for* ODGEN *read* OGDEN.

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CHRYSOPSIS NERVOSA: FIG. 3, a small inflorescence, × 1. Var. STENOLEPIS: FIG. 1, portion of plant, × 1; FIG. 2, head, × 4.

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Chrysopsis nervosa: fig. 3, head, × 4.
Var. virgata: fig. 1, type, × 1/3; fig. 2, head, × 4.